Facility History
for
Building 771 at the Rocky Flats Plant

Compiled for EM-30 by
M.H. Chew & Associates, Inc.
under contract to BDM International, Inc.
Contract Number 06S10044
Prime Contract Number DE-AC001-90EW48063

April 1992

Jack
Weaver
OPS -771
Mgr.

WITHOUT ORIGINAL PP. 21-41
DOES NOT CONTAIN
UNCLASSIFIED CONTROLLED
NUCLEAR INFORMATION
Reviewing Official: J. A. NESHEIM
EM/EC Class'n Name Office
Date: 10-13-08

Note: This copy contains placeholders for pages 21-41 which appear to have been removed because of concerns about possible Unclassified Controlled Nuclear Information (UCNI) content. The original pages were not available for review on 10-13-08.

M H Chew & Associates, Inc
SAFETY PROFESSIONALS

REVIEWED BY Peg Hanrahan (JANI)
(DOE/RF)
DATE 5/1/92

1129

Facility History

for

Building 771 at the Rocky Flats Plant

Compiled for EM-30 by

M. H. Chew & Associates, Inc.

under contract to BDM International, Inc.

Contract Number 06S10044

Prime Contract Number DE-AC001-90EW48063

April 1992

Table of Contents

Figures List

Purpose

This document is intended to be a central, unclassified, reference for the history of Building 771 This is important for both near term transition and long term decontamination and decommissioning planning This building, like several others in the nuclear weapons production complex, has had a history characterized by several unique factors

1) The building has been continuously supporting complex operations involving very large amounts of toxic and radioactive materials

2) Access has been restricted and knowledge of processes has been classified This has restricted the flow of information regarding important events bearing on cleanup activities There are many "unknown conditions "

3) Safety standards have changed over time making previously acceptable operations now unacceptable

4) Priorities have changed. In the years of maximum output, production was the number one priority Actions were taken that may have been at a higher risk to safety than acceptable by today's standards. Many process modifications didn't include removal and/or cleanup of original equipment.

5) Only a few people are available who know the history, are aware of what was happening on a day-to-day basis, and understand why decisions were made in Building 771.

In the current environment, the main emphasis is focused on environmental restoration and waste management activities This document provides information and gives all involved a sense of the depth and complexity of the clean up issues needing to be addressed

Introduction

As Building 771 (B771) undergoes a transfer from production (DOE DP) to decontamination and decommissioning (DOE EM), information on the facility conditions must be gathered to provide for a controlled transition from one organization to another Many facility and process modifications were made during its forty year lifetime and documentation is not readily available Therefore, an effort was undertaken to collect this data.

Building 771 processed vast amounts of plutonium and other actinides Processing occurred in a production mode with a full 3-shift per day operation for nearly four decades The result is a well worn, heavily used facility with potential for widespread low level contamination in all laboratory areas.

The Rocky Flats Plant (RFP) mission is currently undergoing a significant change. The transition of the "landlord" responsibility for several of the production facilities is being made from Office of Defense Programs (DP) to the Office of Environmental Restoration and Waste Management (EM) Characterization of the "as-found" configurations for turnover of these DP facilities is necessary to determine the appropriate planning for a smooth transition. This facility history document is the first part of the transition This document contains historic data on the following areas

- Characterization of the facility (e g., "as-found" configuration, radioactive material and hazardous chemical inventories)
- Contamination mapping of the facility

In addition to the facility history document, characteristic design and as-built documentation for these transition facilities will need to be developed to support terminal clean-out (TCO), safe shutdown, and eventual decontamination and decommissioning (D&D) This documentation should include

- Decontamination, dismantling, and removal strategy for contaminated components
- Temporary protective storage of facility components
- Disposition of dismantled components
- Dismantling or restoration of facility
- Waste management

Areas where emphasis should be placed in preparing D&D planning should include

- Development of procedures for characterization, decontamination, dismantling, and segmentation of large components
- Application of radioactive and hazardous chemicals inventory data in work planning (e g , worker dose estimation, nuclear criticality safety assessment, protective equipment requirements, chemical decontamination process, surface decontamination, and demolition)
- Safety system requirements to maintain facility safety envelope
- Waste collection, treatment, packaging, and disposition
- Assessment of environmental impacts

Background on Building 771 Transition Planning

The facility was placed in a curtailed mode of operation in 1989 due to changes in the nation's requirements for weapons production and safety concerns about the building's operations prompted (maintenance of the safety envelope, but no processing taking place) In early 1992, DOE direction changed the requirements for restarting this facility such that it is not required to return to production mode. At Rocky Flats Plant, only Building 559 (analytical chemistry) will be operating and Building 707 (fabrication) will be in a stand-by status B771 is now directed to go into a D&D mode. These changes prompted the need for documenting the history and present conditions of B771 before the process managers and operators are dispersed to other functions and other sites

Meetings and interviews were held with former Dow Chemical and Rockwell International Building 771 (B771) Building Managers and operators to document their historic perspectives and "corporate memory" on B771 operations, modifications, and incidents over the last forty years. This information, much of which has never been formally documented, will be of great value in supporting the transition of this building from DP to EM. These meetings and interviews with the former B771 managers and observations from a walkthrough of the building are documented for use by DOE/HQ EM, DOE/RFO, and the EG&G Transition team

By taking this opportunity to interview former Rocky Flats managers and employees, historical data was consolidated into a central reference document. This document is intended to be used not only for near-term transition planning, but for long-term decontamination and decommissioning planning as well.

6

Review Methodology

A special effort was conducted to document the potential hazards that may be encountered during the safe shutdown and decommissioning process of Building 771 This effort included literature search, building management interviews, and a walk-down of the facility

The literature search included three sets of facility drawings (1952, 1962, and 1975-9), and numerous sketches provided through viewgraphs and the Safety Analysis Reports These have provided the background of what activities were conducted in the building and why the facility was modified

Building management interviews were conducted during February 1992. These individuals provided accounts of events that occurred and processes contained within the facility They have also aided in placing levels of significance on the incidents reported to DOE to determine when and to what extent these events impacted the facility conditions

The field walk-down of the facility was performed by the review team (including the former building managers) to validate the configuration control of the floor plans and equipment layouts This also occurred in February 1992. The building walk-through was tape recorded to ensure accurate record of all details discussed (however, classified discussions were not included) In addition, the team took notes on both past and current radiological conditions Data on radionuclide and chemical forms processed are included

The resulting report contains a list of the most significant events and plan/equipment maps with overlays of the potential contamination types and levels which are important to the decontamination and decommissioning planning efforts

The review team consisted of the following members

Ray Boyle	EG&G Rocky Flats (in building from 67-73s, operations superintendent)
Ken Calkins	SAIC (in building from 55-70, bldg mgr mid-60s)
Joe Quayle	EG&G Rocky Flats (in building from 74-92, utilities mgr)
Gary Schuetz	DOE-RFO Plutonium Recovery Facility Representative (771 and 371)
Ed Vejvoda	SAIC (in building from 56-75, R&D bldg mgr 70-74)
Jack Weaver	EG&G Rocky Flats (in building from 61-88, bldg mgr 85-88)
Al Williams	SAIC (in building from 57-74, bldg mgr 70-72)
Melton Chew	M. H. Chew & Associates, Inc. (CAI)
Samuel Chu	CAI
Rodger Dickey	CAI

Historical Basis

Dow Chemical was the contractor for this Government Owned Contractor Operated (GOCO) facility from 1951 to June 30, 1975 From July 1, 1975 through December, 1989, Rockwell International (Aerospace Division) was the contractor EG&G - Rocky Flats, Inc. has been the contractor for the plant from January 1990 to the present. The plant owner/regulator was the Atomic Energy Commission from 1952 to 1974, the Energy Research and Development Administration from 1974 to 1978, and the Department of Energy from 1978 to the present.

Original Process Scope - 1952

The facility was originally constructed (Austin Company 1951-1953) as a totally self-contained plutonium fabrication and reprocessing facility The initial facility included

- Plutonium part fabrication including inspection, holding, foundry, machining, coating, inspection, radiography and shipping
- Plutonium residue recovery operations for metal recycle
- Oralloy decontamination (removal of plutonium)
- Chemistry and metallurgy development laboratories
- Support laboratories (chemical standards, analytical chemistry, and metallurgical analysis)
- Laundry facilities
- Maintenance shops
- Offices, cafeteria, tool crib, stock room, showers/change rooms

Plutonium reprocessing included east and west chemical process (chem) glovebox lines (rooms 146, 148), a process control room (room 147), and a recovery process area (room 149) Plutonium manufacturing was conducted on the south side of the facility and plutonium recovery on north side of the facility. Plutonium nitrate solutions were assayed, adjusted for acidity, and than processed by peroxide precipitation, calcination, hydrofluorination, and reduction. Room 149 accommodated residue recovery using dissolution and Tributyl Phosphate (TBP) solvent extraction processes.

The plutonium metal product was transferred from the east and west "chem" lines via conveyer to the plutonium fabrication area (rooms 181/182). Rooms 181, 182, and 183 were the plutonium manufacturing areas including casting and foundry work from 1952 through 1958 Rooms 187 and 188 were used as material storage vaults (for plutonium pits). The Analytical Laboratories were in rooms between column lines 2/8 and G/M. The Development Laboratories were in rooms between column lines 2/6 and C/G (room 180).

The second floor of the facility contained the utilities and associated mechanical equipment including process vacuum equipment, chemical makeup, steam boilers, emergency generator and switchgear, ventilation fans, and plenums.

The original design utilized recovery processes adopted from Los Alamos National Laboratories and the Hanford Site. Plutonium processing began in May 1953 using plutonium nitrate solutions received from the Hanford facility. Several years later, plutonium nitrate solutions were also received from the Oak Ridge National Laboratory The original design capacity of the B771

8

facility was 25 kilograms of plutonium per month, operating one shift five days a week. There was little recycle recovery at this point in time (because there were no weapons being taken out of the stockpile) Therefore, the recycle stream consisted only of the facilities' own scrap reprocessing

1957 (Fire Aftermath)

Increasing complexity of the plutonium part fabrication equipment processes necessitated the construction of a dedicated plutonium fabrication facility, Building 776 In addition, more old weapons had started to return from the stockpile as they were retired Plutonium recycle became a much more prominent part of the facility's process scope during this period The fabrication functions in rooms 181/182 were discontinued in 1957 Building 776 replaced the manufacturing operations including plutonium machining and parts assembly that were previously carried out in the south-side rooms When this occurred, the gloveboxes were first kept on standby, then eventually removed from B771 and discarded to make room for metallurgical R&D Laboratories This space was then converted to a research and development metals laboratory (metallurgy and special alloying) Several other transuranic elements were handled in the Chemistry R&D Laboratory areas (room 180) and Special Recovery areas (room 146) This laboratory area has operated to date Also in 1957, americium removal was converted from the TBP solvent extraction process to a nitric acid solution ion exchange process. Due to this change , most of the original equipment in room 149 was replaced in 1957-1959

Plutonium nitrate solution shipments were discontinued in 1959 Solution transfers were changed to metal transfers to alleviate the shipper/receiver differences associated with solution chemistry Since that time, the feed source to the facility has been metal from off-site and internally generated plutonium, either scrap metal or skull oxide from foundry operations

All piping in the facility was originally color coded based on its service Although this will aid in identifying process lines, many of the piping runs were modified so that these color codes cannot be trusted for absolute identification of internal contamination Later, piping was label identified rather than color coded Magenta paint was used to identify contaminated areas

There were only limited installations of pencil or annular tanks at this point in time. Tanks in the building were either pencil tanks of favorable geometry or geometrically non-critically safe filled with Raschig rings (Original tankage consisted of pencil tanks or non-critically safe tanks that were administratively controlled.) A few tanks in the building were geometrically non-critically safe and were not filled with Raschig rings All process piping was typically routed in the overhead with limited piping embedded in the floor. Solution movements external to the gloveboxes were actuated by vacuum transfer Pumps were used for in-glovebox processes and in some tank recirculation systems There were some manually-pumped transfers inside gloveboxes A piping embed in room 148 existed since the mid-1950s.

Room 184 was a radiography vault.

Rooms 134 and 161 were photographic dark rooms and their drains have potential chemical and radioactive contamination.

Room 146 has large contaminated areas due to a plutonium nitrate precipitate explosion which blew out the glovebox windows on June 14, 1957

A large plutonium metal chip fire occurred in room 180 in September of 1957 which seriously contaminated all of the 180 rooms (metals laboratory and most of the building) The floor slab under the wall between room 180 (column line G) is extremely contaminated with Pu from the room 180 fires (and in a subsequent incident in room 164 in 1985) One drain line from room 180

9

went directly to the outfall (Walnut Creek) and caused potential contamination of the creek during the fire Decontamination of the building except room 180 took approximately 3 months Room 180 was sealed for approximately 4 years before it was decontaminated Extensive renovations to the area were made in the late 1960's after the decontamination efforts were completed The Zone I exhaust filters were modified to provided improved filter seals and repair heat stress damage after the fire (This was one of three modifications to the building exhaust system)

Room 149 was the original plutonium recovery area, and therefore, had no floor drains Other areas of the building were fitted with floor drains. After the 1969 fire in B776, all building floor drains on the first floor were sealed Some were contaminated by the 1957 fire and capped in that condition The floor drains in room 114 were capped prior to the area being used for processing The floor embeds in room 149 are the only other contaminated piping known to be in the floor slab

Piping and tankage in room 148 was installed (informally called the "Snake Pit") in a tank vault area on the east side of the room From the start, it was plagued with continual contamination incidents due to tank/pipe leakage. This piping was removed in the '66-68 upgrades and the pits filled with cement. A continuous precipitation line was installed and anion exchange replaced the solvent extraction process The room has been subject to heavy contamination several times Several of these incidents have contaminated the room from floor to ceiling and wall to wall. Many contamination incidents involved nitric acid solution spills that etched the floor or walls and could not be effectively decontaminated. Floors and walls were painted over after the removable surface contamination was removed and only fixed contamination remained.

Contamination in these areas where spills or leakage occurred have been cleaned and painted over, in some cases this may be six or seven layers deep The entire building staff would be involved in clean ups when major contaminations occurred.

Equipment in most B771 areas has had large quantities of plutonium processed (100 to 500 kg of plutonium per month) Contamination frequently occurred in all tankage, process piping, and bag-in/bag-out areas All criticality drains were subject to overflow occasionally due to glovebox ventilation pressure surges which forced liquid out of the drain cups These surges were usually caused by process upsets, such as gasket failures during reduction furnace operations and small fires in the dissolver system This resulted in floor contaminations on a routine basis. (These were not corrected until the mid-1980s when the "J"-type glovebox criticality safety drains were designed and installed)

The first-generation incinerator (Line 37) for contaminated solid residue recovery was installed in room 149 om 1957 and is currently the oldest process line in the room. This process had its own dedicated filtration system which exhausted into the facility Zone I exhaust system.

A tunnel was installed to allow feed plutonium oxide material to be physically transferred from B776 to B771 located at approximately column line 4 going south from the building. Transfers typically took place on criticality safe transfer carts with four 2-kg cans per cart. In addition, some metal skulls were also transferred to B771 for recovery in similar manner.

1962-64 (AE - Associated Nucleonics, Inc Expansion)

A process throughput requirement increase caused changes to the process equipment layouts and addition of the room 114 space to the recovery functions. Throughput increased to about 600 kilograms per month Main feed material to B771 was skull oxide from B776 processing (post-1963) The basic processes remained the same, except that anion exchange replaced solvent extraction as a purification technique, and the batch method of chemical processing was changed to continuous processing This necessitated an addition on the northeast of the building to

accommodate a new cafeteen, offices, and conference room Also, at this time, the original laundry area in room 124 was converted into additional locker room space

Room 149 mechanical and thermal residue recovery processes such as incineration and scarfing (abrasion cleaning of graphite molds) are considered "slow-side" recovery processes The incinerator (Line 37, room 149) underwent major revisions in 1962. The off-gas system was also modified at this time

Room 114 expansion was implemented in a 2 year period between 1962-1964 by Associated Nucleonics, Inc Ion-exchange, dissolution, and precipitation (considered "fast-side" chemically based recovery processes), were installed in this room This included ion exchange columns, a peroxide precipitator, and a calciner

30-liter pencil tanks were mounted in the overhead in the north-central portion of the room Some were boxed and shielded Pipe joint leakage was a constant problem where leakage was usually at a flanged joint.

New equipment for americium removal was installed in room 149, Line 30 Americium Recovery now consisted of a multiple stage anion and cation exchange process which produced americium oxide as product (for shipment in lead pigs to Oak Ridge) This glovebox line used up to 110-mil lead loaded gloves Feed for the process came from the precipitation filtrate stream. The feed was stored in a set of tanks external to the gloveboxes. These (Filtrate Recovery) tanks are located approximately at column line U near 11. Am pencil tanks were housed in a tank vault at column T 10. There was also an Am nitrate solution storage tank located outside the building on the north side This tank and transfer lines were later cut up and removed (late 1960s) and the pad was buried in the approximate vicinity of the current location of T-771A, north door number 2.

There was piping in pipe chases connecting room 180 to rooms 114 and 149 These handled plutonium nitrate solutions produced in the Chemical Research and Development area. There is also a pipe chase south of room 114 (approximately column line M) which transferred waste solutions from the building to Building 774 This pipe chase is contaminated

A developmental continuous hydrofluorinator was installed in room 146 for testing. It was moved into room 148 in 1961, then later (1966-68) removed A fluid bed volatile fluoride unit was built in room 146 in 1968-69

The electrical power supply and distribution system underwent major changes in configuration to separate the safety related requirements from other facility requirements. Prior to this all equipment in the building was tied into both normal and emergency power.

Areas most likely to have spill contamination within the building are the Snake Pit in room 149 (column lines 11-12 and F-H), Line 30, Line 32 at the east end, Tank Farm Areas, original Skull Dissolution line in the SW corner of room 149 (column lines 9-10 and C-D) and room 180.

When recovery process equipment was relocated from room 146 to rooms 114, 148, and 149, room 146 became available for Special Recovery Operations (SRO) processing. During 1965-1966 new special recovery process equipment was installed in room 146. The special recovery functions of Manufacturing Technology were absorbed by Chemistry Research and Development (R&D) in 1967. SRO capabilities include all recovery processes, solvent extraction, and mixed actinide recovery. Special recovery processing equipment was expanded into the east access corridor in 1965. Another office expansion on the northwest of the building was constructed in 1966-67 The cafeteen and office additions added approximately 40 x 200 ft of floor space. The facility operations included.

11

- Increased plutonium residue recovery throughput for metal production
- Special recovery processing
- Chemistry and Metallurgical R & D Laboratories
- Americium Recovery as oxide
- Analytical chemistry support for processes
- Maintenance shops
- Offices, cafeteria, tool crib, stock room, showers/change rooms

1966-68 (Special Recovery Expansion)

Room 146 was modified in 1966-1968 to include glovebox lines to handle tracer isotope studies, Neptunium, Uranium-233, and Oralloy in fluoride chemistry research, and development of special alloying processes, and recovery of off-normal recycle material. This area contained a wet chemistry line and furnaces A series of gloveboxes designated M-T-1 through M-T-6 which were never used are located in this room. Others of the M-T series boxes contained a Tributyl Phosphate (TBP) solvent extraction process. These "M-T" series gloveboxes are still in place today.

A volatile fluoride processing system was installed to explore the removal of plutonium fluoride from residues It was later removed

The house vacuum was installed in room 141 during the 1962 expansion. This room had been a records storage vault and then an SNM materials storage vault.

The slag-wool filter drum system on the incinerator in room 149 was replaced by a filter plenum on the second floor during this time period This new 2-stage HEPA filter plenum exhausts to the Zone I filters for the facility (providing a total of 3-stages of HEPA filtration)

1969

In 1969-1970, an interior renovation took place, upgrading and expanding the analytical laboratory facility At the same time, a 60 x 78 ft concrete block addition was built on the west side of the facility to consolidate all the maintenance pipe, sheetmetal, and painting activities. A maintenance carpentry shop was erected west of Building 770. During 1969, the tunnel between B771 and B776 was converted into an SNM storage facility. This tunnel became a vault in 1971.

The transfer tunnel between B776 and B771 was fitted with storage racks and handled 2-kg oxide cans and 2-kg buttons. Potentially, some 13-kg ingots may have been stored but this would have been the exception, not the rule. The tunnel has had some fires (7/30/69) and spills. The 1969 fire in B776 resulted in smoke contamination of the tunnel and 15,000+ gallons of contaminated fire suppression water running through the tunnel. A main fire suppression line break in B776 flooded the tunnel and the water transported the stored oxide cans into B771 in 1972.

1971

A waste drum handling facility joining B771 and 774 (approximately 40 x 111 ft) was constructed in 1971-72. The women's locker facilities were expanded in 1979 (and again in 1984), utilizing a large part of the stock room. The tunnel vault was decommissioned in 1982 when the B371

Stacker/Remever became operational. The facility included

- Continued plutonium residue recovery with newer mechanical and chemical recovery processes and equipment improvements and upgrades for higher throughput
- Americium recovery processing
- Special recovery processing
- Chemistry and Metallurgical R & D Laboratories
- Analytical chemistry support for processes
- Maintenance shops
- Offices, cafeteria, tool crib, stock room, showers/change rooms
- Evaporator for pond water (B774)
- Increased non-destructive analysis of residues and waste

During the mid-1970s, only minor modifications were done to the facility with processes running "as-is" as an interim measure while Building 371 came on line. When it was realized that B371 was going to be indefinitely delayed, process equipment upgrades and maintenance were again started.

The pencil tanks in room 114 were removed and shelved storage was implemented in the shielded areas near Lines 1, 2, 3, and 4. Room 114 had a series of horizontal pencil tanks for Pu nitrate storage which leaked. Therefore these rooms were highly contaminated during the pencil tank times and probably still have floor contamination between the paint layers.

There was an overhead rabbit system from Line 8 9 storage to Line 17 in room 114/114B. The rabbit transfer system also ran from Line 17 in room 114B to Line 19 in room 148.

Vault at column lines 10-11 U-V was for Pu fluoride storage.

An exhaust plenum upgrade was implemented in 1970-72. This upgrade provided HVAC system which met new AEC criterion and provided for DOP filter bank testing. The primary change was addition of a second stage of HEPA filters in the plenum (resulting in two stages of filtration).

Room 141 suffered from nearly continuous leakage of the Nash vacuum pumps causing gross contamination of all surfaces. The pumps were never mounted in gloveboxes. The room was refloored several times. It was undergoing a cleanup in the late 1970s which was halted. The Nash pumps were removed and piping disconnected and sealed. The concrete pads were then partially demolished, a jack-hammer, rubble, and waste drums were left in place, and the door is weld sealed closed. There is no lighting or HVAC ventilation in the room. This room is still contaminated.

Mid 1980s

During the mid-1980s some gloveboxes from B371 (half of Line 5 in room 114) were moved into B771 to allow the facility to continue operations into the mid-1990s.

Another main exhaust plenum upgrade was implemented in 1984. This included modifying the

plenum by welding a stainless steel room liner to the exit of the last stage of filters to provide higher integrity filtration (reduce leakage around the filter mounting frame) This also included upgrades to all utilities at a cost of $40 M

Since October 1989

All plutonium operations have been stopped in place An SNM year-end inventory was performed for accountability when the stoppage was implemented Ion-exchange columns were eluted and wetted and have been kept in this configuration since that time. The tank inventories have remained stagnant since the stoppage No mixing or turnover of the tanks has occurred in this interim period

The HVAC is the only mechanical equipment that has been operating in the interim period The glovebox lines were cleaned and wiped-down and the HEPA filters were replaced during the initial stoppage There has been no maintenance of glovebox windows. However, the gloves and bags have been replaced as necessary The criticality drains on the gloveboxes are inspected bi-weekly per the OSR surveillance requirements All criticality drains have been replaced by the new "J"-style drains except for Line 30 There has been no major action to remove plutonium in the ventilation ducts except some NDA measurements and characterization activities. Some of the HVAC ducts are above the plutonium contamination action limits and will require plutonium removal There has been no maintenance on valves and fittings in the building since stoppage The valve gasket replacement from Teflon™ to Gylon™ was not finished. The valves with Teflon fittings have not been operated and may leak when used. There has been no maintenance on nuts and bolts to maintain specification torques (flanges and process piping fittings) Some fittings may be as loose as finger-tight due to normal building vibrations (related to HVAC operation). The cooling water supply and return system has not been in use since the stoppage. The steam supply has not been used since the stoppage Neither the plant air nor the inert air supply systems have been in use since the stoppage

Process Line Functions

Room 114

Line 1 (Americium Recovery) was a multiple stage anion and cation exchange for Am recovery and purification for producing Americium oxide as product (for shipment in lead pigs to Oak Ridge) This glovebox line used 90-mil lead loaded gloves The process used filtrate recovery tankage which required a set of tanks external to the gloveboxes (FR tanks located approximately on column line U near 11) There was also an Am nitrate solution storage tank located outside the building on the north side This tank and transfer lines were later removed (late 1960s) and the pad was buried in the approximate vicinity of the current location of T-771A.

Line 2 (Plutonium Metal Dissolution, HEPA Filter Dismantling, Sludge Dissolution, Glass/Metal Leaching) used 10M nitric acid solution containing 0 5% HF or CaF for dissolving metal.

Line 3 (Plutonium Oxide Dissolution) used a nitric acid/0 5% hydrofluoric acid solution based process.

Line 4 (FR Ion Exchange originally, later Staging Area)

Line 5 (Spray Dissolution) used a acid solution to dissolve plutonium from classified components and other furnace components

Line 5A (Vacuum System for Calciner and Line 5)

Line 6 (Fluorinator HF Scrubber)

Line 7 (Hydrofluorination) plutonium oxide conversion to plutonium fluoride

Line 7A (Vacuum System for Line 6 and 7)

Line 8 (Storage) Calcined plutonium oxide storage (green cake)

Line 9 (Storage) Calcined plutonium oxide storage (green cake)

Line 10 (Calciner and Off-gas Scrubber) decomposed the plutonium peroxide to oxide

Line 11 (Evaporator) concentrated nitric acid solution from the ion exchange processes This box is in moderate condition.

Line 12 (Sampling Box for Effluent Tankages)

Line 13 (Batching) Liquid transfer valve box. (Pencil tanks 500-506)

Line 14 (Evaporator) This box is in very poor conditions and should not be used without major repair Many windows are discolored and etched. This box leaks.

Line 15 (Precipitation) Plutonium Peroxide precipitation from nitrate solution.

Line 16 (Calciner) Peroxide decomposition by thermal heating with mechanical screw for transport.

Line 17 (Fluorination) Plutonium oxide conversion to plutonium fluoride.

Line 17C (Reduction/Button Break Out) thermally reduced the plutonium fluoride to metal using calcium metal. This box allowed the resultant metal to be separated from the calcium fluoride salt.

Line 18 (House Vacuum) Nash pumps originally, replaced by Bingham vacuum pumps which serve Line 40

Room 149

Line 19 (Reduction) Plutonium fluoride conversion in batches by furnace heat treatment to metal, also plutonium fluoride reduction to plutonium metal

Line 20 (Button Breakout) Plutonium metal removal after reduction Breakout, sampling, and preparation for foundry surge storage

Line 21 (Hot Batching Box) Pass-though from Line 25

Line 22 (Burn Box) Plutonium chip oxidation box conducted in ovens (in later days)
(Ion Exchange) Plutonium nitrate solution purification in early days

Line 23 (Dissolution Box) Plutonium recovery from sand slag and crucibles (SS&C)

Line 24 (Dissolution Box) Plutonium recovery from plutonium oxide or plutonium fluoride.

Line 25 (Dissolution Box) Plutonium recovery from plutonium sludge and incinerator ash

Line 25A (unknown)

Line 25B (Ash Hydrofluorination)

Line 26 (Pump Box) Serves the fume scrubber for the dissolution lines and evaporators

Line 27 (Storage Box) Plutonium fluoride storage glovebox

Line 28 (unknown)

Line 29 (Laboratory Waste Accumulation) Collection and segregation of laboratory wastes to remove chlorides by cation exchange.

Line 30 (Chloride Recovery) Acid dissolution and ion exchange of the pyrochemical salts from B776. Tanks at the north end of Line 30 were disconnected and capped (D-203 through D-206, D-218, and D-219) in 1990

Line 31 (Sampling Box) Sampling for KOH waste and steam condensate.

Line 32 (Dissolution Line) Nitric acid dissolver for sludge, ash, ash heel, oxide heel, fluoride heel from line 37.

Line 33 (Incinerator Off-gas Scrubber Pumps) Pumps for KOH solution transport within the scrubber system. Neutralizes the acidic gases (HCl and SO_2) from the incinerator

Line 34 (unknown)

Line 35 (Incinerator Off-gas Scrubber Pumps) Pumps for KOH solution transport within the scrubber system Neutralizes the acidic gases (HCl and SO_2) from the incinerator

Line 36 (unknown)

Line 37 (Incinerator) All contaminated combustible solids from the RFP for plutonium recovery

Line 38 (Ash Grinding) Mechanical size reduction of the ash removed from the incinerator includes jaw crusher and ball mill.

Line 39 (Vacuum System to Support Line 33 Scrubber System)

Line 40 (SS&C Dissolution Line until 1975)

Line 41 (SS&C Milling and Grinding until 1975)

Line 42 (Ion Exchange) Handles solutions from dissolution Lines 3, 23, 24, 25 and recycle solution from Line 15, 16, 14, 13, 5 and 2. There is some embeded piping

Line 43A (Sorting) Processes miscellaneous items (graphite crucibles).

Line 43B/C (Crushing) Milling and grinding of sand, slag, crucibles, and graphite from Line 20, later from B776 and B707 for size reduction and surface area increase to aid in dissolution

Line 43D (Ion Exchange) Processing of the miscellaneous materials for plutonium recovery. Backup for exchange capacity for Line 42.

Line 44 (Metal Leach/Tantalum Leach, later Process Vacuum for Chemistry Technology and Production Support Laboratories)

<u>Room 181</u>
Line 45 (Ash/Ash Heel Dissolution)

Line 46 (Calciner for Ash Heels)

Line 47 (Laboratory Waste Processing)

Line 48 (Miscellaneous Processing)

<u>Room 149</u>
Line 49 (Waste Hood) for laboratory waste processing.

Line 50 (Filtration Box) for filtering KOH from Line 33.

Line 53 (OY Leach) removed plutonium contamination from Oralloy parts with hot concentrated nitric acid.

CCC (Contamination Control Cell) for drum opening and repackaging. This unit has its own ventilation and HEPA filters. The CCC is a small stainless steel room (nominally 5 x 5 x 7 feet). This is located in the NW corner of the room 149.

Room 146
MT-1 (Special Recovery Residue Roasting)

MT-2 (Special Parts Leaching)

MT-3A (Mixed Pu/U Oxide Dissolution)

MT-3B (Uranyl Nitrate Precipitation)

MT-3C (Uranyl Nitrate Calcination)

MT-4 (Ion Exchange, Solution Evaporation, and Extraction Chromatography)

MT-5 (Special Recovery Size Reduction/Solid Pu Scrap Volatile Reduction) includes a hammer mill for crushing, and a muffle furnace for volatile impurity removal.

MT-7 (PUREX Solvent Extraction)

SR-14 (PUREX solvent extraction)

Facility Chemical Usage

Appendix 2 contains a list of the chemicals used in the process and required to maintain the building It does not indicate total quantities of all chemicals handled since the building began operation, but does indicate current inventories where those values were available All main process chemicals are designated. This section provides attention to the types of chemical hazards that may be encountered but does not quantify them

Facility Plans, Equipment Layouts, and Contamination Overlays

This section of the report contains facility floor plans with equipment for several points in time In addition, contamination and incident occurrence overlays have been prepared to indicate general levels of contamination of areas during the facility lifetime.

Figure 1 is the current (1982 to present) facility plan with a column line overlay

The next series of figures are facility plan sketches with process functional areas indicated This includes:

Figure 2 (1952 - original layout),
Figure 3 (1972 - post-1962/63 BNI modifications, room 114 converted to plutonium recovery),
Figure 4 (1979 - mid-1970s revisions for further increased throughput), and
Figure 5 (1982 - last modifications made to facility).

The second series of figures include the equipment layouts. This includes

Figure 6 (1952 - original layout),
Figure 7 (1962 - first expansion for increased production throughput, inclusion of room 114 as process area, change from nitrate solution to metal feed),
Figure 8 (1966 - removal of east chemical line and expansion of the special recovery to increase recycle throughput in room 146),
Figure 9 (1968 - modification of the head end of the metal production line and the chloride recovery in room 148/149),
Figure 10 (1970 - addition on west for hot shops),
Figure 11 (1972 - addition on east for waste packaging and handling),
Figure 12 (1979 - modifications for additional recycle burn and salt dissolution capacity and the incinerator line in room 149, changes in the analytical chemistry areas, addition on west for plenum deluge catch tank area),
Figure 13 (1982 - changes in the tankage to include substantially increased capacity in room 149, current configuration).

The next figures indicate contaminated areas of the facility. A legend is provided with each of these figures to detail the cause and extent of the contamination. This includes:

Figure 14 (This figure indicates locations where repetitive spills occurred over the facility lifetime),
Figure 15 (This figure indicates locations of the major accident events)

The final figures detail the second floor of the facility. This area underwent major modifications once during the facility's history. These were:

Figure 16 (1952 - original floor plan),
Figure 17 (1974 - major changes to the filter plenums to provide additional filtration stages

and fire protection to the filters),
Figure 18 (This figure indicates locations where contamination is expected due to facility operations)

THIS PAGE
HAS BEEN LEFT BLANK
DUE TO CLASSIFICATION ISSUES.

PERSONNEL WITH ACCESS TO
UNCLASSIFIED CONTROLLED
NUCLEAR INFORMATION (UCNI)
MAY OBTAIN THIS INFORMATION
FROM THE
BUILDING 771 CLUSTER
CLOSURE PROJECT MANAGER

THIS PAGE
HAS BEEN LEFT BLANK
DUE TO CLASSIFICATION ISSUES.

PERSONNEL WITH ACCESS TO
UNCLASSIFIED CONTROLLED
NUCLEAR INFORMATION (UCNI)
MAY OBTAIN THIS INFORMATION
FROM THE
BUILDING 771 CLUSTER
CLOSURE PROJECT MANAGER

THIS PAGE
HAS BEEN LEFT BLANK
DUE TO CLASSIFICATION ISSUES.

PERSONNEL WITH ACCESS TO
UNCLASSIFIED CONTROLLED
NUCLEAR INFORMATION (UCNI)
MAY OBTAIN THIS INFORMATION
FROM THE
BUILDING 771 CLUSTER
CLOSURE PROJECT MANAGER

THIS PAGE
HAS BEEN LEFT BLANK
DUE TO CLASSIFICATION ISSUES.

PERSONNEL WITH ACCESS TO
UNCLASSIFIED CONTROLLED
NUCLEAR INFORMATION (UCNI)
MAY OBTAIN THIS INFORMATION
FROM THE
BUILDING 771 CLUSTER
CLOSURE PROJECT MANAGER

THIS PAGE
HAS BEEN LEFT BLANK
DUE TO CLASSIFICATION ISSUES.

PERSONNEL WITH ACCESS TO
UNCLASSIFIED CONTROLLED
NUCLEAR INFORMATION (UCNI)
MAY OBTAIN THIS INFORMATION
FROM THE
BUILDING 771 CLUSTER
CLOSURE PROJECT MANAGER

THIS PAGE
HAS BEEN LEFT BLANK
DUE TO CLASSIFICATION ISSUES.

PERSONNEL WITH ACCESS TO
UNCLASSIFIED CONTROLLED
NUCLEAR INFORMATION (UCNI)
MAY OBTAIN THIS INFORMATION
FROM THE
BUILDING 771 CLUSTER
CLOSURE PROJECT MANAGER

THIS PAGE
HAS BEEN LEFT BLANK
DUE TO CLASSIFICATION ISSUES.

PERSONNEL WITH ACCESS TO
UNCLASSIFIED CONTROLLED
NUCLEAR INFORMATION (UCNI)
MAY OBTAIN THIS INFORMATION
FROM THE
BUILDING 771 CLUSTER
CLOSURE PROJECT MANAGER

THIS PAGE
HAS BEEN LEFT BLANK
DUE TO CLASSIFICATION ISSUES.

PERSONNEL WITH ACCESS TO
UNCLASSIFIED CONTROLLED
NUCLEAR INFORMATION (UCNI)
MAY OBTAIN THIS INFORMATION
FROM THE
BUILDING 771 CLUSTER
CLOSURE PROJECT MANAGER

THIS PAGE
HAS BEEN LEFT BLANK
DUE TO CLASSIFICATION ISSUES.

PERSONNEL WITH ACCESS TO
UNCLASSIFIED CONTROLLED
NUCLEAR INFORMATION (UCNI)
MAY OBTAIN THIS INFORMATION
FROM THE
BUILDING 771 CLUSTER
CLOSURE PROJECT MANAGER

THIS PAGE
HAS BEEN LEFT BLANK
DUE TO CLASSIFICATION ISSUES.

PERSONNEL WITH ACCESS TO
UNCLASSIFIED CONTROLLED
NUCLEAR INFORMATION (UCNI)
MAY OBTAIN THIS INFORMATION
FROM THE
BUILDING 771 CLUSTER
CLOSURE PROJECT MANAGER

THIS PAGE
HAS BEEN LEFT BLANK
DUE TO CLASSIFICATION ISSUES.

PERSONNEL WITH ACCESS TO
UNCLASSIFIED CONTROLLED
NUCLEAR INFORMATION (UCNI)
MAY OBTAIN THIS INFORMATION
FROM THE
BUILDING 771 CLUSTER
CLOSURE PROJECT MANAGER

THIS PAGE
HAS BEEN LEFT BLANK
DUE TO CLASSIFICATION ISSUES.

PERSONNEL WITH ACCESS TO
UNCLASSIFIED CONTROLLED
NUCLEAR INFORMATION (UCNI)
MAY OBTAIN THIS INFORMATION
FROM THE
BUILDING 771 CLUSTER
CLOSURE PROJECT MANAGER

THIS PAGE
HAS BEEN LEFT BLANK
DUE TO CLASSIFICATION ISSUES.

PERSONNEL WITH ACCESS TO
UNCLASSIFIED CONTROLLED
NUCLEAR INFORMATION (UCNI)
MAY OBTAIN THIS INFORMATION
FROM THE
BUILDING 771 CLUSTER
CLOSURE PROJECT MANAGER

THIS PAGE
HAS BEEN LEFT BLANK
DUE TO CLASSIFICATION ISSUES.

PERSONNEL WITH ACCESS TO
UNCLASSIFIED CONTROLLED
NUCLEAR INFORMATION (UCNI)
MAY OBTAIN THIS INFORMATION
FROM THE
BUILDING 771 CLUSTER
CLOSURE PROJECT MANAGER

THIS PAGE
HAS BEEN LEFT BLANK
DUE TO CLASSIFICATION ISSUES.

PERSONNEL WITH ACCESS TO
UNCLASSIFIED CONTROLLED
NUCLEAR INFORMATION (UCNI)
MAY OBTAIN THIS INFORMATION
FROM THE
BUILDING 771 CLUSTER
CLOSURE PROJECT MANAGER

THIS PAGE
HAS BEEN LEFT BLANK
DUE TO CLASSIFICATION ISSUES.

PERSONNEL WITH ACCESS TO
UNCLASSIFIED CONTROLLED
NUCLEAR INFORMATION (UCNI)
MAY OBTAIN THIS INFORMATION
FROM THE
BUILDING 771 CLUSTER
CLOSURE PROJECT MANAGER

THIS PAGE
HAS BEEN LEFT BLANK
DUE TO CLASSIFICATION ISSUES.

PERSONNEL WITH ACCESS TO
UNCLASSIFIED CONTROLLED
NUCLEAR INFORMATION (UCNI)
MAY OBTAIN THIS INFORMATION
FROM THE
BUILDING 771 CLUSTER
CLOSURE PROJECT MANAGER

THIS PAGE
HAS BEEN LEFT BLANK
DUE TO CLASSIFICATION ISSUES.

PERSONNEL WITH ACCESS TO
UNCLASSIFIED CONTROLLED
NUCLEAR INFORMATION (UCNI)
MAY OBTAIN THIS INFORMATION
FROM THE
BUILDING 771 CLUSTER
CLOSURE PROJECT MANAGER

THIS PAGE
HAS BEEN LEFT BLANK
DUE TO CLASSIFICATION ISSUES.

PERSONNEL WITH ACCESS TO
UNCLASSIFIED CONTROLLED
NUCLEAR INFORMATION (UCNI)
MAY OBTAIN THIS INFORMATION
FROM THE
BUILDING 771 CLUSTER
CLOSURE PROJECT MANAGER

THIS PAGE
HAS BEEN LEFT BLANK
DUE TO CLASSIFICATION ISSUES.

PERSONNEL WITH ACCESS TO
UNCLASSIFIED CONTROLLED
NUCLEAR INFORMATION (UCNI)
MAY OBTAIN THIS INFORMATION
FROM THE
BUILDING 771 CLUSTER
CLOSURE PROJECT MANAGER

THIS PAGE
HAS BEEN LEFT BLANK
DUE TO CLASSIFICATION ISSUES.

PERSONNEL WITH ACCESS TO
UNCLASSIFIED CONTROLLED
NUCLEAR INFORMATION (UCNI)
MAY OBTAIN THIS INFORMATION
FROM THE
BUILDING 771 CLUSTER
CLOSURE PROJECT MANAGER

Chronology of Incidents by Room

This section lists reported events from several sources All dates listed indicate incident occurrences. The dates denoted in bold print indicate contamination releases to a room area. The dates denoted in both bold and underlined print indicate major consequences to the facility (multiple rooms involved, long term decontamination required, etc.) Dates denoted in bold, outlined, and underlined print are the major events that occurred in the facility. These may be cross-referenced to descriptions of the events contained in Appendix 1 to this report.

Room 110 Spill (11/18/76)

Room 114 Fire (12/28/65, 3/11/66, 3/6/67, 6/21/67, 8/10/67, 12/7/67, 1/15/68, 2/13/68, 2/21/68, 3/26/68, 4/3/68, 5/4/68, 6/10/68, 7/17/68, 8/23/68, 10/14/68, 10/14/68, 11/12/68, 12/16/68, 1/28/69, 2/7/69, 3/28/69, 8/21/69, 9/8/69, 11/14/69, 11/16/69, 11/23/69, 11/23/69, 1/6/70, 7/23/70, 10/13/70, 11/11/70, 11/22/70, 11/27/70, 12/21/70, 2/18/71, 2/20/72, 3/14/71, 5/3/71, 1/28/87, 8/31/87)
Room 114 Explosion (12/29/71)
Room 114 Spill (9/6/69, 1/6/70, 3/12/70, 5/6/70, 11/11/70, 12/16/70, 1/22/71, 2/20/72, 2/29/72, 10/3/72, 11/13/72, 6/26/73, 7/24/74, 3/3/75, 7/31/75, 1/13/76, 6/29/76, 6/30/76, 12/10/76, 9/20/78, 6/22/83, 2/20/86, 4/24/86, 5/16/86, 3/1/87, 1/13/88)
Room 114 Criticality Infraction (11/23/71, 10/15/73, 4/15/74, 1/13/77, 4/29/82, 5/6/82, 5/10/82, 5/11/82, 7/13/82, 8/4/82, 8/9/82, 8/10/82, 9/29/82, 4/21/83, 12/15/83, 1/17/84, 1/30/84, 2/12/84, 3/30/84, 4/5/84, 4/6/84, 6/6/84, 7/13/84, 6/27/85, 7/1/85, 11/1/85, 3/17/86, 5/3/86, 7/11/86, 10/27/86, 10/27/86, 4/13/87, 4/23/87, 8/19/87, 11/16/87)

Room 141 Spill (3/19/73)

Room 146 Fire (12/7/62, 1/10/63, 10/8/63)
Room 146 Explosion (6/14/57, 2/26/72)
Room 146 Spill (8/24/73, 7/16/75, 9/5/75, 7/13/79)
Room 146 Criticality Infraction (4/14/87, 7/29/87)

Room 147 Spill (6/20/63, 2/18/74, 3/9/77)
Room 147 Criticality Infraction (2/5/87)

Room 148 Fire (10/1/59, 12/21/60, 2/11/63, 2/18/63, 5/29/62, 6/5/62, 1/18/63, 1/24/63, 1/24/63, 5/17/63, 5/17/63, 10/8/63, 10/17/63, 11/18/63, 11/20/63, 4/11/64, 10/20/64, 12/17/64, 6/20/66, 8/8/66, 5/12/67, 6/7/67, 4/20/68, 9/15/68, 10/14/68, 11/6/68, 4/10/69, 7/10/69, 7/11/69, 8/14/69, 9/9/69, 10/8/69, 10/21/69, 10/25/69, 10/25/69, 11/14/69, 11/16/69, 11/16/69, 2/14/70, 2/18/70, 4/30/70, 5/5/70, 5/14/70, 6/20/70, 11/15/70, 2/2/71)
Room 148 Explosion (11/6/68, 4/19/71, 7/1/72)
Room 148 Spill (9/6/72, 11/17/73, 12/10/86)
Room 148 Criticality Infraction (6/21/86, 10/12/86)

Room 149 Fire (1/19/61, 3/25/63, 9/7/62, 10/8/62, 7/14/63, 9/17/63, 4/24/64, 4/28/64, 6/18/64, 11/2/64, 11/16/64, 12/17/64, 1/28/65, 3/8/65, 9/16/65, 10/22/65, 11/25/65, 6/28/66, 7/10/66, 8/18/66, 2/7/67, 8/11/67, 1/9/68, 11/15/68, 11/26/68, 2/17/69, 5/19/69, 6/25/69, 2/25/70, 3/5/70, 4/1/70, 4/15/70, 5/8/70, 6/18/70, 10/19/70, 11/14/70, 11/14/70, 11/20/70, 12/11/70, 4/19/71, 9/13/91, 10/10/71, 3/2/72, 3/30/72, 4/10/72, 5/15/72, 7/24/72, 2/7/84, 8/27/84, 3/2/87)
Room 149 Explosion (10/24/66)

Room 149 Spill (6/25/64, 5/6/65, 5/8/67, 5/7/71, 9/12/71, 2/8/72, 5/17/72, 6/21/72, 1/5/73, 1/21/73, 3/15/73, 4/11/73, 7/30/75, 7/20/76, 7/20/76, 4/27/78, 2/3/82, 3/25/83, 7/7/84, 9/19/85, 9/19/85, 5/19/87, 1/12/88)
Room 149 Criticality Infraction (1/7/76, 3/19/82, 7/8/83, 8/2/83, 7/25/84, 7/11/85, 1/14/86, 1/24/86, 2/18/86, 9/2/86, 8/13/87, 10/13/87, 11/4/87)

Room 153 Fire (8/17/64, 10/12/67)
Room 153 Explosion (6/16/65)
Room 153 Spill (6/13/83)
Room 153 Criticality Infraction (2/1/83)

Room 156 Fire (12/3/59, 9/29/65)
Room 156 Explosion (9/29/65)

Room 159 Fire (2/20/67)
Room 160 Fire (4/20/64)
Room 155/159/160 Spill (2/10/64, 2/19/64)

Room 163 Spill (2/28/72, 11/6/86)

Room 164 Explosion (12/3/85)
Room 164 Fire (8/22/71)

Room 166 Fire (3/14/61, 9/6/61)
Room 166 Spill (4/5/64, 7/3/64)

Room 180 Fire (8/22/60, 10/31/60, 3/1/63, 5/16/62, 1/21/64, 2/17/64, 10/23/65, 11/9/65)
Room 180 Explosion (1/22/64)
Room 180 Spill (10/2/63)

Room 180A Fire (4/3/68, 5/12/70, 9/10/87)
Room 180A Explosion (9/[illegible]/[illegible], 9/25/64, 9/26/64)
Room 180A Spill (3/24/72)

Room 180C Fire (1/28/69)

Room 181 Fire (2/2/65, 12/13/65, 9/1/66, 6/2/67)
Room 181 Spill (4/23/63, 3/26/85, 7/23/85)

Room 181A Spill (6/19/79)

Room 182 Fire (9/30/55, 6/28/65, 7/25/67, 8/27/69)
Room 182 Explosion (6/28/65, 9/15/67)
Room 182 Spill (5/2/72, 12/7/76)

Room 183 Spill (9/4/87)

Room 187 Fire (3/17/64)

Room 188 Spill (9/19/63)

Room 189 Spill (5/19/76)

Room 204 Fire (12/4/62)

Room 240 Fire (12/20/63, 1/28/64, 2/4/64)

Room 246A HF Spill (4/21/78)

Room 247 KOH Spill (9/8/59, 4/19/82)
Room 247 HNO_2 Spill (6/26/82, 3/28/85, 8/25/85, 5/10/86)

Room 249 Fire (4/12/66, 7/21/66, 8/29/66, 9/13/66, 10/12/66, 10/18/66, 1/18/67, 5/8/67, 7/14/67, 7/17/67, 8/21/67, 10/11/67, 12/22/72, 10/18/78, 7/2/80)
Room 249 Flood (2/4/76, 3/3/78)

Room 281 Flood (9/11/66)

Tunnel Fire (7/30/69)
Tunnel Contamination (5/11/69, 10/3/69, 11/7/69)

References

"Building 771 Utilization Plan - Plutonium Operations," Rockwell International, North American Space Operations, Rocky Flats Plant, June 27, 1986 (This report is available in the DOE-RFO Safety and Health Division Library in Buildng 116)

"Historical Release Report for the Rocky Flats Plant - Volume II -- Appendices," U. S Department of Energy, Environmental Restoration Program, October 30, 1991 (This report is available in the DOE-RFO Safety and Health Division Library in Buildng 116)

"Chemical Control System Material Inventory Listing - Rocky Flats Plant R.F., Area 5, Building 771," EG&G, Rocky Flats, Inc., April 4, 1992. (This report is available in the DOE-RFO Safety and Health Division Library in Buildng 116 This report is published from the EG&G "ccsr_inv_listing" database)

"Building 771 Final Safety Analysis Report," Rockwell International Energy Systems Group, Rocky Flats Plant, June, 1987 (This report is available in the DOE-RFO Safety and Health Division Library in Buildng 116)

Engineering Drawings - Building 771 Floor Plans and Revisions [These drawings are available from the DOE Facility Representative, G W Schuetz, (303) 966-6713 in Building 771, Room 119D]

Appendix 1
Chronology of Incidents Reported for Building 771

9/30/55	182	Fire resulted from metal briquette spontaneously igniting. Radioactive material became unconfined and contaminated area. $9500 loss
6/14/57	146	A peroxide tank chemical explosion occurred showering employees with glass or metal fragments and contaminated solution. Employee suffered a minor laceration of right temple and lacerated tip of the little finger of right hand. $30,936 loss.
9/11/57	180	Fire and contamination of all B771. Burning plastic released hydrogen which resulted in an explosion in the building exhaust ducts and fire in the main plenum. $818,000 loss. Report attached.
6/9/58	159	Electrical fire.
6/20/58	147	Electrical fire.
7/7/58	149	Rag fire inside skull box.
7/21/58	146	Metal fire inside K-4 furnace.
1/6/59	149	Combustible material ignition.
1/24/59	148	Metal fire.
2/24/59	149	Chip fire
2/26/59	152	Flammable liquid ignition.
5/26/59	148	Electrical fire.
9/8/59	247	Catalytic decomposition of 50% peroxide in an insulated storage tank. Catalyst in the form of neoprene gasket material probably introduced through faulty valve of piping. $1500 loss
10/1/59	148	Spark inside skull box ignited paint.
10/16/59	156	Chip fire.
8/22/60	180	Hot metal caused ignition of filter
10/31/60	180	Pu ignition.
12/21/60	148	Overheated hot plate caused ignition of material
1/19/61	149	Sparks ignited rags

3/14/61	166	Alcohol ignition.
9/6/61	166	Ignition of filings.
10/25/61	771	Boiler exploded while it was being lit off.
12/15/61	147	Electrical fire in transformer.
5/16/62	180	Chip and oil fire.
5/18/62	166	Acetone ignition outside box.
5/29/62	148	Metal explosion in furnace.
6/5/62	148	Gasket failure (explosion) in K-furnace.
9/7/62	149	Chip fire—ignition caused by welders.
9/19/62	Hallway	Spontaneous combustion rubber gloves and nitric acid.
10/8/62	149	Chip fire.
11/10/62	148	Electrical—transformer to lathe on fire.
12/4/62	204	Combustible trash being burned in incinerator caused ignition of plenum.
12/7/62	146	Fire was caused due to inadequate seal between the furnace top plate and the reduction vessel. The inadequate seal resulted when a gasket from a previous reduction stuck in the furnace causing second gasket to cook during the vessel insertion into the furnace. $250 loss.
1/10/63	146	Fire and contamination happened when the gasket on the reduction vessel failed causing molten metal to be ejected from it, and pressurized the glovebox line and failure of the gloves. $691 loss.
1/18/63	148	K-2 reduction furnace. Fire and contamination happened when gasket failed. Failure caused molten metal to be ejected from the furnace and pressurized the glovebox line failing some of the gloves. $691 loss.
1/18/63	148	Paint ignited—caused by welders
1/24/63	148	Oil fire in K-furnace.
1/24/63	148	Gasket failure in K-furnace. $441 loss.
2/11/63	148	Gasket failure in K-furnace. $715 loss.

2/18/63	148	Plastic fell off dryer into trough dissolver, causing it to ignite.
3/1/63	180	Chip fire.
3/25/63	149	Metal fire in skull box.
3/27/63	114	Lighting ballast on fire.
4/23/63	181	Contaminated nitric acid spill. $5662 loss.
5/17/63	148	Gasket failure in K-furnace. Failure caused damage to furnace heating coil and block valve. No fire or contamination. $1081 loss.
6/20/63	147	Pin hole leak in stainless steel line over false ceiling, line carries high Pu solution. Hole caused by chemical reaction. $8364 loss.
7/14/63	149	Metal fire.
7/19/63	771	A cracked electrode caused a hole to be burned into the mold well of the furnace flooding the furnace with cooling water. $330 loss.
9/17/63	149	Rag and glove fire in dissolver box.
9/19/63	188	A hangdown tube from a thermo microbalance fell and broke spreading contamination. Contaminated equipment placed in unsafe storage. $1500 loss
10/2/63	180	Employee broke tygon sight tube with portable ladder he was moving. Contamination spread. $2500 loss.
10/7/63	148	Gasket failure in K-furnace.
10/8/63	146	Fire in K-furnace. No contamination release. $947 loss.
10/8/63	148	Fire in K-furnace due to gasket failure. No contamination release. $1038 loss.
11/8/63	148, 149, 165	Cross connection valve between nitric acid supply line and the distilled water system was left open and acid migrated into the distilled water system. $1131 loss.
11/18/63	148	Gasket failure resulting in fire No contamination release. $790 loss.
11/20/63	148	Gasket failure in K-furnace No contamination spread. $789 loss

12/20/63	240	Burning trash in incinerator caused filter plenum to ignite.
12/22/63	Parking Lot	Employee slipped on ice—sprained back.
1/7/64	Hallway	A hole was noticed in a contaminated waste bag and was immediately taped shut. The bag was moved down the hallway to be checked on a counter, thus spreading contamination in the hallway $110 loss.
1/21/64	180	Chip fire. Autoignition of metal in an open can. No damage as metal was allowed to burn itself out in a magnesium oxide crucible. No loss.
1/22/64	180, Line 3A	Pu explosion. No damage as the metal was not tightly contained and the explosion blew the fire out. No loss.
1/24/64	R & D Ceramics Lab	When furnace power was increased to 1/2 maximum capacity, the copper electrode holder was consumed by high temperature, releasing a small amount of contaminated cooling water. $440 loss.
1/28/64	240	Burning of combustibles in incinerator caused filters in plenum to ignite. Complete loss of first stage of filters. $856 loss.
2/4/64	237	Welder cutting pipe caused paper wipes to ignite No damage
2/4/64	240	Ignition of soot accumulation on face of first stage filters in the incinerator filter plenum Complete loss of first stage of filters $??? loss
2/10/64	159, 160	An attempt to free a plugged vacuum line with water resulted in the release of contaminated water through a pin hole in the line. $2056 loss.
2/17/64	180	Chip fire. Spontaneous ignition of a small quantity of sodium and Pu granules in a glass beaker No damage or contamination, fire burned itself out. No loss
2/19/64	155, 159, 160	Employee carrying a leaking sample carton of Pu fluoride. Contamination spread $214 loss.
3/17/64	187	Heat from reaction cracked reactor tube allowing hot Pu hydride to become exposed to air and burn Contamination spread. $1071 loss
4/5/64	166	Two 4-liter bottles of liquid salvage leaked. $224 loss
4/11/64	148	Gasket failure K-furnace

4/20/64	160	Pu chip fire.
4/24/64	149	Sludge of fire in skull box.
4/28/64	149	Fire in "trough" box
5/5/64	---	Potable water backed up in compressed air lines because valve was left open. Equipment damage. $308 loss.
6/18/64	149	Fire in sludge box.
6/24/64	Hallway	Partial collapse of false ceiling (8 1/2 x 24 ft section) $600 loss
6/25/64	149	Open valve allowed escape of contaminated acid. $960 loss.
7/3/64	166	Employee dropped sample vial he was carrying when he bumped his arm on glovebox. Contamination spread. $383 loss.
7/15/64	146	Hydrofluoric acid solution was pumped into ammonia solution storage tanks by mistake as the acid drum label had weathered away $386 loss
8/17/64	153	Chip fire
9/18/64	157	Electrical short in vacuum pot ignited wiring
9/19/64	147	Fire in electrical transformer to Ajax converter
9/25/64	180A	Shipping container holding 5g of Am exploded. No injuries (Time 7 41 a.m.) Contaminated room 180 and 180A. Loss 2.5g Am. Cause unknown. Could be chemical explosion or slow pressure build-up $3700 loss
9/26/64	180A	Explosion inside shipping container
10/20/64	148	Gasket failure K-furnace
11/2/64	149	Chip fire in trough box.
11/16/64	149	Small chip fire
12/17/64	149	Chip fire in graphite box
12/17/64	148	Electrical arc in K-furnace ignited paper wipes
1/28/65	149	Sludge ignited
3/3/65	181	Sludge ignited

3/5/65	149	Welding sparks from overhead work ignited fresh paint material on floor.
3/18/65	149	Material in "trough" box ignited
3/25/65	149	Acid feed line valve accidentally opened. Contamination spread. $272 loss.
4/2/65	165	Electrical failure.
4/8/65	153	Acetone fire.
4/23/65	146	Electrical fault in powerstat ignited insulation.
5/6/65	149	Product feed sprayed out of loose flange on new line. Line not checked after construction. Contamination spread. $7557 loss.
5/13/65	149	Electrical fault in K-furnace.
6/16/65	153	Cyclohexane explosion in glovebox. Fumes from spill. Cyclohexane ignited by electric motor. $300 loss
6/28/65	182	1-1-1-trichloroethane explosion in drybox ignited by burning metal chip during machining operation. $4405 loss.
8/14/65	135	Clothes left in dryer caught fire.
8/15/65	135	Dryer fire in laundry $816 loss
9/16/65	149	Gasket failure on K-furnace.
9/29/65	156	Sweepings and fines ignited.
9/29/65	156	Pu metal filing explosion, filings from coupons and other sweepings were placed in styrene jar and placed on shelf in drybox when material exploded $214 loss
10/05/65	152	Electrical failure ignited insulation and a cooling water line.
10/22/65	149	Combustible waste outside incinerator ignited.
10/23/65	180	Ignition occurred while mixing materials.
11/9/65	180	Maintenance was preparing a drybox line for removal. Technician was using part of box to complete work. Paint with 50% acetone was being used for stripping and masking of paint and contamination. Guillotine door in drybox line

		between paint area and manufacturing test muffle furnace was not completely closed. As painter put second container of paint in air lock, a flash of fire met him. $23,253 loss.
11/25/65	149	K-furnace failure ignited rubber hose
12/13/65	181	Chips in carton ignited.
12/21/65	152	Electrical failure in furnace.
12/28/65	114	Storage vessel ruptured material ignited
12/28/65	181	Container on hot plate boiled dry and ignited material.
1/3/66	181	Welding ignited spray paint from aerosol can.
1/11/66	152	Ignition of combustible material near furnace.
2/18/66	248	Ignition of combustible waste material in barrel.
3/11/66	114	Welding spark ignited 8" x 8" intake filter $3054 loss.
4/12/66	249	Sparks from incinerator ignited material on filters Soot on the face of both 1st and 2nd stages provided fuel. $764 loss.
4/28/66	149	Welding spark ignited combustible waste in room
5/6/66	153	Plastic oxygen supply hose to Pu burning experiment ignited.
6/15/66	148	Electrical coil failure on K-furnace
6/20/66	148	Gasket failure on K-furnace.
6/28/66	149	Material being crushed ignited.
7/10/66	149	Combustibles in waste drum ignited by nitric acid
7/21/66	249	Spark from incinerator ignited material on filters Four filters were burned. $275 loss
8/8/66	148	Gasket failure on K-furnace.
8/18/66	149	Heat from incinerator ignited oily waste at bottom of box.
8/29/66	249	Sparks from waste incinerator ignited material on filters.
9/1/66	181	Material on dryer belt in calciner ignited.

9/11/66	281	Automatic sprinkler valve opened, flooding plenum with 6" of water. Fire department was flushing hydrants and told utility operators to disregard alarms $880 loss.
9/13/66	249	Sparks from waste incinerator ignited material on filters.
10/12/66	249	Sparks from waste incinerator ignited material on filters.
10/18/66	249	Sparks from waste incinerator ignited material on filters.
10/24/66	149	Natural gas explosion occurred in waste incinerator, blowing off bags and causing a window fracture. $4630 loss.
12/12/66	114	Hot plate ignited plastic hose.
1/6/67	154	Burned out ballast in light fixture
1/18/67	249	Glovebox combustible waste incinerator overheated, igniting filters in plenum
2/7/67	149	Pu ignition while being run through recover process
2/20/67	159	Spontaneous combustion of nitric acid and Kim-wipes
3/6/67	114	Spontaneous combustion of nitric acid and rubber gloves inside glovebox
5/8/67	249	Glovebox combustible trash incinerator overheated, igniting filters in plenum
5/8/67	149	Pressurization of glovebox caused contamination. Filters were being removed in the incinerator plenum $2000 loss
5/12/67	148	Ruptured gasket in K-2 furnace
6/2/67	181	Spontaneous combustion of incinerator ash while being reprocessed.
6/7/67	148	Ruptured gasket in K-2 furnace, causing ignition of drybox glove
6/21/67	114	Ignition of two small filters inside dissolver pot.
7/14/67	249	Glovebox—combustible waste incinerator overheated, causing ignition of filters in plenum $732 loss

7/17/67	249	Glovebox—combustible waste incinerator overheated, causing ignition of filters in plenum $457 loss.
7/18/67	249	Glovebox—combustible waste incinerator overheated, causing ignition of filters in plenum $252 loss.
7/25/67	182	Ignition of chips inside lathe box.
8/10/67	114	Ignition of Pu while going through recovery operation.
8/11/67	149	Electrical cord on portable vacuum cleaner shorted and ignited in a glovebox.
8/11/67	149	Overheated waste incinerator caused insulation on exhaust duct to ignite in glovebox.
8/21/67	249	Glovebox—combustible waste incinerator overheated, causing ignition of filters in plenum
9/15/67	182	External radiation exposures-Type B. Foundry operations involved with the ZPPR project.
10/11/67	249	Glovebox—combustible waste incinerator overheated, causing ignition of filters in plenum
10/12/67	153	Employee picked up small container of Pu and bottom of container fell out. Pu ignited.
12/7/67	114	Pu ignition inside metal container
1/9/68	149	Material inside of scrap pipe ignited
1/15/68	114	Filter being dried ignited.
2/13/68	114	Filter being leached became dry and ignited.
2/21/68	114	Sparks from welding ignited filter in glovebox.
3/26/68	114	Welding sparks ignited filter in glovebox.
4/3/68	114	Material in leaching operation became dry and ignited.
4/3/68	180A	Accumulation of acetylene from welding ignited $898 loss
4/19/68	East Dock	55 gal drum of hydrogen peroxide punctured. No injuries No environmental problems
4/20/68	148	Hot material ignited small brush

4/20/68	148	Gasket failed on K-furnace $565 loss.
5/4/68	114	Filter ignition from welding operation.
6/6/68	114	Ignition of Pu and turnings
6/10/68	114	Heater left on caused filters to ignite.
6/19/68	249	An employee in supplied air changing filter in booster III suffered heat exhaustion.
6/25/68	281	The hose on a full face respirator came off while the employee was in the main plenum. No inhalation exposure.
7/17/68	114, Line 2	Pu ignition while going through leaching operation. $150 loss.
8/23/68	114	Possible explosion inside dissolving pot.
9/15/68	148	Gasket failure in K-2 furnace. $875 loss.
10/1/68	179	Ignition of tank valve around Presto-lite torch.
10/14/68	114	Spontaneous combustion between nitric acid and combustible waste.
10/14/68	114	Skull ignition.
10/28/68	148	Small fire in K-2 furnace.
11/6/68	148	Gasket failure in K-2 failure. Chemical explosion caused over-pressurization of K-furnace due to chemical reaction of lab waste mistakenly added to process controlled metal for reduction. $1790 loss
11/12/68	114, Line 2	Pu ignition. No contamination spread. $125 loss
11/14/68	180D	Ignition of plastic funnel.
11/15/68	149	Pu ignition in glovebox.
11/19/68	181	Ignition of electrical wiring due to welding operation.
11/26/68	114	Spontaneous combustion of nitric acid and combustible waste.
12/16/68	114	Skull ignition.
1/28/69	114	Pu ignition while leaching operation was in process
1/28/69	180C	A spark ignited 50-50 mixture of methanol and carbon tetrachloride.

2/7/69	114	Spontaneous combustion between leaded gloves and acid inside paper boxes
2/17/69	149	Door to fire box stuck in the open position, causing rubber gloves to ignite.
3/28/69	114	Pu ignition inside container.
4/10/69	148	Gasket failure in K-2 furnace resulted in ignition of glovebox gloves. Contamination spread $3443 loss.
5/11/69	Tunnel	Major fire in B776. Started in glovebox system All of B776 and B777 contaminated. Some radioactive material released to the environment. Smoke drawn into tunnel by B771 ventilation system. (CD69-6251/6252/6253/6254/6255/6256/7051/and CD71-3740) $42,000,000 loss.
5/19/69	149	Filters in glovebox housing incinerator plugged up, causing accumulation of heat, which ignited glove. $1970 loss.
6/25/69	149	Ignition of filter while going through leaching operation.
7/10/69	148	Gasket failure in K-2 furnace resulted in Pu ignition
7/11/69	148	Gasket failure in K-furnace. $370 loss.
7/30/69	Tunnel	Ignition of Pu in storage container Contamination spread. $20,000 loss
8/14/69	148	Gasket failure in K-2 furnace resulted in ignition of Pu.
8/21/69	114	Ignition of Pu during sorting operation.
8/27/69	182	Ignition of Pu chips inside storage container
9/6/69	114	Operator opened wrong fill valve Contamination spread. $3180 loss
9/8/69	114	Chemical reaction inside Nash pump box.
9/9/69	148	Gasket failure in K-furnace
10/3/69	Tunnel	The H&V operator replacing a valve in the pneumatic control system. The system has an interlock designed to shut off the supply fans when the exhaust fans stop To replace the relief valve, it was necessary to shut off air to the control system It caused the exhaust inlet damper to open all the way, causing a

		greater negative pressure in 771 tunnel than 776 exhaust system for the tunnel, pulled contamination out of the ducts. $2688 loss
10/8/69	148	Gasket failure in K-2 furnace
10/21/69	148	Gasket failure in K-2 furnace
10/23/69	182	Leak in hold caused Pu to fall on furnace floor
10/25/69	148	Gasket failure in K-2 furnace.
10/25/69	148	Gasket failure in K-2 furnace.
11/7/69	Tunnel	Workers tried to remove a section of duct without decontaminating it first. $2488 loss
11/14/69	114	Pu ignition during dissolving operation.
11/14/69	148	Gasket failure in K-2 furnace.
11/16/69	148, Line 16	Gasket failure in K-2 furnace. Contamination spread. $763 loss.
11/16/69	114, Line 3	Line 3 pressurized due to a rapid reduction when dissolving Pu turnings in nitric acid Chemical operators were making a bag cut on the other end of the line. $1074 loss
11/16/69	148	Reduction furnace gasket failure damaged block valve and induction coil and released contamination.
11/23/69	114	Pu ignition while going through dissolving process
11/23/69	114	Ignition of filters during leaching operation.
1/6/70	114	Material in dissolver ignited.
1/6/70	114	Rapid reaction when dissolving Pu turnings in nitric acid. Overflow and drain out criticality drain onto floor $995 loss.
2/14/70	148	Gasket failure in K-furnace Contamination spread to room $531 loss.
2/18/70	148	Gasket failure in K-furnace.
2/25/70	149	Fire escaped to outside of fire box.
3/5/70	149	Material ignited outside of fire box.
3/12/70	114	Partially opened valve allowed water in process line to overflow out the criticality drain onto the floor Contamination spread to room $641 loss

4/1/70	149	Fire escaped from fire box into adjacent material in glovebox.
4/13/70	106	Paper jam in xerox machine.
4/15/70	149	Combustible fluid in plastic bottle ignited outside fire box. Burned through bags and released contamination to room. $820 loss.
4/30/70	148	Gasket failure resulted in loss of one block valve and one induction coil. No contamination spread. $ 405 loss
5/5/70	148	Gasket failure resulted in loss of block valve and induction coil. No contamination spread. $1388 loss.
5/6/70	114	Three nitric acid valves in glovebox were open releasing contamination to room. $2580 loss.
5/8/70	149	Material outside of fire box ignited.
5/12/70	182A	Sparks from buffing operation ignited a glove. Contamination $550 loss.
5/14/70	148	Gasket failure on K-furnace. $1258 loss
6/18/70	149	Chemical reaction within waste drum
6/20/70	114	Material being dried on hot plate ignited.
7/20/70	149	Electrical short in solenoid
7/23/70	114	Material on hot plate ignited.
10/13/70	114	Pu skull ignited during recovery operation.
10/19/70	149	Fire escaped outside of fire box and ignited feed material.
10/23/70	North Area	Gasoline fire in engine compartment of employee's vehicle
11/11/70	114	Pu skull ignited in recovery operation.
11/11/70	---	Vacuum line pressurized with 125 psi steam forced contaminated material through wall of vacuum gage collar. This was done to unplug line. Contamination spread. $1090 loss
11/14/70	149	Gasket failure in K-furnace.
11/14/70	149	Unburned material in container of fly ash ignited

11/15/70	148	Gasket failure in K-furnace. $526 loss.
11/20/70	149	Carton of sludge fell out of fire box.
11/22/70	114	Sludge ignited in recovery operation
11/24/70	104	Paper jam in Xerox machine.
11/27/70	114	Pot boiled dry and material ignited.
12/2/70	148	Equipment failure. Gasket failure on K furnace. $550 loss.
12/11/70	149	Bellows on incinerator off gas system deteriorated and broke, releasing contamination. $3060 loss.
12/16/70	114	Wrong valve type was installed on acid line. Stainless valve was replaced with Monel valve. Contamination spread. $1640 loss.
12/21/70	114	Pu skull ignited in recovery operation.
12/24/70	283	Gas welding operation ignited oil drippings.
12/26/70	114	Tape and plastic bag ignited by hot plate.
1/22/71	114	Improper seal on dry box window at maintenance change resulted in contamination spread. $817 loss
2/2/71	148 Line 32	FulFlo filter being dried ignited. No contamination spread $300 loss.
2/18/71	114	Spontaneous ignition of combustibles in waste drum.
2/20/71	114	2 kg Pu material in dissolver pot ignited. No contamination spread. $155 loss.
3/14/71	114	FulFlo filter being dried ignited.
4/12/71	---	A steam condensate line ruptured, spraying contaminated steam into the room. Cause due to galvanic corrosion of dissimilar metals. Contamination spread. $5777 loss
4/19/71	149	Gasket failed on reduction furnace
4/19/71	148	Abnormal high pressure generated by reduction of dirty fluoride. Contamination spread. $13,500 loss
4/22/71	476	Water leaked through roof and shorted out wiring to motor starter for x-ray unit. $1000 loss
5/3/71	114	Material in dissolver pot dried and ignited

5/7/71	149, Line 41	Pin hole leaks at the 304 elbow of the skull line caused airborne contamination $3352 loss
5/22/71	Parking lot	Electrical fault caused ignition of wiring.
6/1/71	149, Line 41	Maintenance changing dry box exhaust valve waste bag was held to catch waste product. An abnormal amount of condensation flowed out of the pipe. Health physics monitor decided to dump the waste bag because of possibility of a criticality incident. $2271 loss.
6/17/71	---	Power outage caused loss of glovebox negative pressure and pressurized the work area with respect to the office area. No injuries, no contamination spread. Caused by circuit overload.
7/2/71	Outside Bldg	Corrosion leak in non-line waste drum stored outside on asphalt pad. Contamination on the pad. $3282 loss
8/22/71	164	Exothermic reaction in a small produce can containing some Pu material. Two employees received reportable lung burdens Pu contamination spread. $60,000 loss.
9/2/71	179	Employee using lathe cut off end of finger when i was caught between chuck jaw and side of cut off tool. DI #26
9/12/71	149	Hole in barrel lines allowed Pu oxide to escape into room Small Pu samples were placed in barrel with combustibles The Pu had ignited some time during storage, causing breach of the barrel lines $15,600 loss
9/13/71	149	Free plutonium metal in a drum to be incinerated burned a hole in waste bag contaminating Room 149 No injuries.
9/21/71	149	Waste outside of fire box was ignited.
10/10/71	149	Fiber pack material ignited outside of fire box.
11/23/71	114	Excess plutonium fluoride found in the hydrofluorinator Criticality infraction. No injuries
12/29/71	114, Line 5	Chemical reaction accompanied by an explosion in a Pu dissolution pot. The pot had contained Be-contaminated Pu chips and fines were being dissolved in nitric acid. Line 5 chemical reaction and explosion Blew out 3 sample plugs and caused 3 criticality drains to overflow No injuries $3770

		loss
2/8/72	149	Pressurized incinerator glovebox due to unsafe manner of punching aerosol glue can near burning incinerator. $20,000 loss
2/20/72	114	Unplugging drain line with steam caused tank to become pressurized and contaminated room. $3931 loss.
2/26/72	East Corridor	Plastic bottle containing residue out of booster III exploded. Nitric acid/metal reaction. Area contaminated. No injuries
2/28/72	163	Glovebox filter was being changed. The old filter stuck, and as extra force was applied some oxide was jarred loose and contaminated area. $2100 loss.
3/2/72	149	Waste ignited while loading incinerator.
3/24/72	181, Line 45	Corroded steam condensate header leaked contamination onto floor by Line 45. $1555 loss.
3/30/72	149	Oil sludge ignited on hot plate
4/10/72	149	Spontaneous combustion of waste materials outside of incinerator due to glovebox airflow reversal. $6000 loss
5/2/72	182	Ice cream carton fell from holder, spilling Pu onto floor $4562 loss
5/15/72	149	Pu sludge ignited while on hot plate
5/17/72	149	While maintenance was cutting a piece of contaminated exhaust pipe, a puff of dust came out the end of the pipe. $1487 loss
6/21/72	149, Line 41	Corroded steam supply header leaked contamination. Cause was galvanic corrosion $2711 loss
7/1/72	148	Impure fluoride or possible impure calcium metal charge caused overpressurization of reduction vessel. Overflowed criticality drains contaminating room. $3871 loss
7/24/72	149	Combustible waste burning around incinerator door
9/6/72	148	Glove failure—old hydrofluorinator nineteen employees body counted, 3 with inhalation exposures Room 148, 149 contaminated (Rodding out operation being performed.)
10/3/72	114	Vacuum pump gasket ruptured, allowing

		contaminated liquid to leak into area. Overflowed criticality drain into room. $1202 loss
11/13/72	114	Maintenance was disassembling chemical pump, when the pump face was opened, more liquid than expected came out into try that was there to catch the liquid. They also placed the mild steel bolts in tray and the contaminate solution reacted with them. $962 loss.
12/22/72	249	Welding on filter holding frames ignited Kim-wipes on plenum roof.
1/5/73	149	Pu contaminated solution leaked onto room floor when valve on tank sample device had matter lodged under the valve seat. $772 loss
1/21/73	149	Chemical reaction caused back pressure on check valve. Threaded connections leaked under pressure to cause spill. $825 loss.
3/15/73	149	Burning waste fell to outside of glovebox.
3/19/73	141	Process liquid containing Pu solution entered a vacuum pump causing overpressurization resulting in a ruptured seal, allowing liquid to flow onto floor, contaminating room and hallway $3728 loss.
4/11/73	149	A window was being changed using sleeve method inside a plastic house One corner came off, causing contamination of the room. $2285 loss
5/3/73	—	Seal leak between balance and glovebox causing contamination. $1112 loss.
6/26/73	114	An air activated valve was improperly installed and when the line was activated, it leaked causing contamination. $3078 loss
8/14/73	—	Booster III temporary loss of supplied breathing air Cause unknown. No injuries
8/24/73	146	Valve left open, which allowed nitric acid to flow from a chemical make-up tank to the tank in the process acid, overfilling tank. This allowed liquid to flow out a vent line which, in turn, flooded a glovebox and liquid ran out the criticality drain. $1600 loss
9/11/73	281 Main plenum	Strange odors Employees wearing full face respirators became dizzy and nauseous No other problems Source unknown.
10/15/73	114, Tank 952	This tank contains recycle solutions generated in

		room 114. The criticality limit is 1 kg. of plutonium. The sludge buildup contained 5.4 kg. Each calibration compared to previous calibration instead of original calibration.
11/17/73	148, Line 20	An employee received an inhalation exposure when he was being undressed at the completion of a supplied breathing air operation.
2/18/74	147	Improperly installed blank in the supply duct between rooms 141 and 147 had a 1/8" gap. When the reversed air flow occurred, Rm 114 became contaminated. $3078 loss.
4/15/74	114, Tank 953	Raschig ring void discovered. Assumed it was caused by incomplete filling. No injuries No problems. Nuclear safety infraction.
7/24/74	114	Poor construction of plastic house on Raschig ring removal from tank caused contamination of area. $833 loss.
1/1/75	114, Line 1	Type C occurrence. External radiation exposure to the hand.
3/3/75	114, Tanks 551-512	Removing head tanks 551-512 in plastic house. One employee received inhalation exposure. Employees wearing FF respirators, exposure received during undressing.
7/16/75	146	Process liquid came in contact with welding area, on process liquid transfer line. This caused pressure and loss of vacuum on the line allowing contamination of area. $2200 loss
7/30/75	149, Line 41	During a grinding operation, an operator unknowingly cut a glove while opening a bag of residue for processing. Operator received more than the permissible lung burden. $1609 loss.
7/31/75	114, Line 16	Unplugging calciner, glove failure, 200 sq ft. floor contaminated.
9/5/75	146A	Flowmeter ruptured, operator sprayed with contaminated caustic and steam
1/7/76	149, Line 24	Criticality infraction. Wet ash heel in line Crit limit allows dry metal only
1/13/76	114, Line 3	One glove failed—four others contaminated, 200 sq ft. of floor contaminated. One employee body counted—2nd count background
1/20/76	---, Tank 453	Employee contaminated arm while removing sludge

		from tank #453.
1/23/76	147, can counter	A one-gallon container filled with towels, used to clean up nitric spill in a line, was found. Reddish brown fumes were being emitted. sur-viv-air units were used to investigate and move the container to Line 3
1/24/76	—	Cotton towels used to clean up nitric acid spill were not thoroughly washed before discarded. Reaction occurred. No injuries. No contamination released.
2/4/76	—	Deluge valve bumped open on the incinerator plenum. 10,290 liters of water in plenum. No injuries.
3/11/76	—	PuO_2 unaccounted for. Trip ticket not kept with container.
3/24/76	149, Line 30	Employee punctured hand with tweezers while working through glovebox gloves. Employee restricted.
5/19/76	189	R&D experimented with high pressure press. Electrical short took place when the two parts of the press made contact. Someone had left the electrical heaters in the on position. This resulted in overheating of a Pu specimen. $13,857 loss.
5/28/76	152B	Employee moving drums, hurt back.
6/29/76	149, Tank 452	Employee removing Raschig rings received acid burn.
6/30/76	114, Line 2, Tank 923	Contamination leaked from a process steam line. (Steam condensate TK 923 put on vacuum 9" HG 15 liters of 12N nitric pulled into steam line out of Line 2)
7/15/76	metal storage cab	Opened bottle of paint stripper turned over and splashed the front of an employee.
7/20/76	149, Line 21C	Contractors working overhead, weld stressed. 2000 sq ft. floor contaminated. No injuries
7/20/76	149, Line 21	Leaking transfer line above Line 21
11/8/76	—	Employee putting nuts on window popped shoulder Surgery required. Accident happened 2-3-76
11/18/76	110	A 2.5 gram sealed source fell on the floor and subsequently leaked contamination in office area and cafeteria. $14,334 loss

12/7/76	Line 216	Caustic overflowed. Crit drain. Liquid level sensor in Line 216 malfunctioned.
12/10/76	114, Line 3	Steam line valve above Line 3 leaked Local area contaminated.
1/13/77	114, Tank 177	Ring void. Crit. infraction.
3/9/77	147, can counter	Container to be counted leaked. Storage area.
4/13/77	181	Employee received electrical burn when a portable down unit was unplugged.
10/14/77	180A	Employee moving ladder, fell, cracked knee cap.
1/20/78	114, Line 16	Puncture wound, contaminated rodding out calciner, cable was frayed.
3/3/78	249, incinerator plenum	Gate valve on the sprinkler system was leaking. A total of 5040 liters was transferred to Bldg. 774 Level alarm in the incinerator was inoperative.
6/20/78	—	Employee playing volleyball. Sprained ankle.
6/26/78	—	Employee playing volleyball sprained ankle, also later on sprained same ankle on stairs
7/2/78	—	Employee walking outside, stepped in hole, turned right ankle.
8/28/78	—	Contractor fiberglassing ducts, hose ruptured—cause appears to be equipment.
9/20/78	114, Line 1	Repacking 2 drums of salts Bag of salt leaking. 5 possible inhalations. 3 initial counts were positive west half of room 114 contaminated to 1,000,000 CPM.
10/10/78	—	Employee twisted wrist, surgery required
10/18/78	249, incinerator plenum	Welding operation resulted in fire First stage of HEPA filters. No injuries
11/15/78	181	Hoist gave way 138 pound pipe fell to floor Cause—poor quality unistrut nut. Pipe hit one employee on the foot.
12/20/78	—	Fire outside of incinerator plenum. Welding operation. No injuries No contamination spread
1/29/79	—	Employee wearing particulate filter only to remove paint stripper Became woozy and fainted

5/4/79	Annex, so. drum count	HEPA filter from plenum FU-2 was punctured Three employees body counted. One initial positive.
6/17/79	180, Line C	Type "C" exposure—second half of month.
6/19/79	181A, Line 46	Glovebox leaked. Two persons body counted—one positive. Leak due to maintenance operation on wall of box
7/13/79	146, Box MT-6	Inlet filter installed cocked. Low box vacuum (0 03") released contamination. Three employees body counted—all three positive Exhaust filter on MT6 was plugged.
8/10/79	Corridor D	Employee put hand through window. West end corridor D
9/5/79	---	Employee moving drum—muscle sprain in hip.
7/20/80	249	Overheat condition reported by utilities ignited filters.
2/3/82	149, Box 44	A needle valve was found to be leaking contaminated nitrate solution. The valve was supposed to be removed, but due to lack of communication, the valve was forgotten.
3/19/82	149, Line 24	NMSPI 82-5, a glovebox contained 3019g Pu, exceeding the limit of 2500g.
4/19/82	247, chem makeup	An improperly positioned caustic fill valve caused the overfilling of a vacuum system mist tank that resulted in 11 65M KOH flowing onto the vacuum system equipment and the floor of the area.
4/29/82	114, Line 5	NMSPI 82-6, used FulFlo filter was placed too closed to other fissile material which exceeded posted spacing requirements.
5/6/82	114, Line 5	NMSPI 82-9, placement of two leached parts in the same spray hood. Only one part is allowed per hood with no exceptions
5/10/82	147A	NMSPI 82-10 Overloading of a 55 gallon drum with 524g of wet FulFlo filters The limit is 500g.
5/11/82	114, Line 3	NMSPI 82-13, dirty oxides were dried and then cut out of the line It was then determined that the oxides contained 12% moisture and were therefore considered wet Pu. The oxides weighed 1954g and the limit for wet Pu is 400g.
5/24/82	114	During a supplied air operation, the docking ring uniting the hood and suit separated and suit was

bb

		breached. Employee transported to medical.
6/26/82	247	A chem. operator was filling a 12M nitric acid tank (tank #23) and left the room to take a sample to the lab. The automatic shut-off valve failed and 100 gallons spilled onto the floor of the room and into the hallway.
7/13/82	114, tank 950	Waste of 2.58g. Pu per liter were transferred to a tank whose limits are 3.7E-3g/liter. This caused a total weight of 1250g in the tank exceeding the 200g limit.
7/15/82	776 truck gate	Alarm technicians were installing conduit in a trench using electric power tools. The fire dept.. began running tests of the sprinkler system in 776. Water resulting from these tests filled the trench with 4" to 12' of water creating an electrical hazard.
8/4/82	148, Line 19	A chem. operator placed two containers of PuF_4 next to a K-furnace with product in the reduction vessel.
8/9/82	149, Line 22	A can of material was introduced into the west burn box that weighed 3483g (limit = 3000g), was the third container added (limit = 2 containers), and was larger than the 1 liter limit for the box.
8/10/82	---	NMSPI 82-19 Three batches of material with Pu contents of 366g, 675g, and 717g were processed in the glovebox, the established limit for each batch is 200g Pu metal.
8/18/82	238	Two machinists were installing a supplied air fan using a hoist. Small pieces of debris began falling so the fan was lowered. Upon inspection, it was found that the ceiling channel was corroded causing the hoist to fail.
9/29/82	114, Line 7	Six containers (approx. 2500g of oxide) were bagged from a cart into Line 7. Temporary limit allowed six containers to be bagged in provided each was limited to a maximum of 1400g of PuO_2 and that the material being transferred came from Lines 8 and 9 only
10/5/82	182, Box 226	The wrong power button was pushed causing power to flow to a furnace which was not in service. As a result, the induction coil overheated causing the insulation to smoke, disintegrate, and ruin the coil.
11/16/82	110 Cafeteen	Employee contaminated by cafeteen table.
11/22/82	114	Two chemical operators removing and packaging

		Raschig rings became hyperventilated, which made them dizzy.
2/1/83	153, GB 1530	NMSPI 83-2. Precipitator pot larger than 4-liters. Posted limit stated no containers greater than 4-liter capacity
3/17/83	110, Cafeteen	Ice cream freezer compressor exploded when compressor failed to shut down after reaching cooling set point.
3/25/83	149, Line 33	Incinerator drum filtration line. Process water line was contaminated with 3 molar caustic (KOH) and plutonium at Line 33.
4/21/83	114, Line 5	NMSPI 83-7 Line 5, parts in both the dissolver vessel and the leaching vessel at same time - not allowed by limits.
5/19/83	146A, MT-1	Line MT-1. A bottle marked Freon was used to degrease a batch of plutonium turnings/sludge. The bottle actually contained aluminum nitrate which reacted with the plutonium, the reaction oxidized and dissolved some of the material.
6/13/83	153	Overhead waste drain leaked contaminated 300 sq. ft. floor space, pipes, a wall, and a glovebox.
6/22/83	114	Contamination release to process area.
7/8/83	149, Line 22	NMSPI 83-12. West storage section of Line 22, one can with 2062 g Pu and one can with 2109 g Pu. Limit = 2500 g Pu.
7/8/83	–	Two air effluent samplers showed higher than normal Pu concentrations. No cause could be determined.
7/13/83	771A	Waste drums were being moved from 771A to 776. Next day, another driver and laborer used same truck and their shoes became contaminated. Through tracing, contaminated drums were found, 3 vehicles were contaminated along with various areas on plant site.
7/25/83	---	NMSPI 83-A. Bag found without proper slits cut in it. Plastic pen allowed to sag and form a reservoir more than two inches deep while being disassembled. Contaminated liquid accumulated in the reservoir
8/2/83	149	A waste collection tank was found to contain more than the 200 g Pu limit.

8/25/83	---	Filter Plenum, 3rd stage FU-28. During supplied air job filter technicians (3) reported getting sick from acid fumes. Cause unknown.
10/11/83	---	NMSPI 83-19 Four position transfer cart had too much shielding
10/14/83	---	NMSPI 83-20. 55-gallon drum limit exceeded when can was counted at can counter to be 300 g, then placed in drum without being split and recounted.
12/15/83	114, Line 7	NMSPI 83-23. Operator cleared plugged discharge of fluorinator, 6500 g Pu fluoride (4530 g Pu) fell to floor. Limit = 3500 g Pu. Classified report.
1/17/84	114	Five used FulFlo filter cartridges were found in the line. Only four are allowed.
1/24/84	181A	A 55 gallon drum was left unattended with the lid off. 55 gallon drums can only be left unattended when the lid is on.
1/30/84	114	Pan Measuring 7 x 12 x 2" was used to collect material from an offgas line. The accepted size is 6 x 9 1/2 x 2"
2/6/84	182	NMSPI 84-7 Bldg 771 and 707 Non-approved furnace equipment (screens) used on top of funnels during casting. All furnace equipment must be approved by criticality engineer.
2/7/84	149, Line 37	Incinerator fire. A fire occurred in the sorting box next to the incinerator Two gloves were burned off of the box at the ring where they attach to the glovebox. Apparent cause: Ignition of fumes coming from the paint stripper-soaked wipes.
2/8/84	---	Criticality drain in a box was partially plugged with tools
2/12/84	114, Line 3	NMSPI 84-11 Two container plus one container of floor sweepings were determined to contain total of 5974 g Pu. Limit = 5000 g Pu.
2/15/84	148	Button Breakout. Electrician either bumped or brushed up against the criticality drain flange Respirators were not worn. Possible inhalation.
3/16/84	149, Line 50	NMSPI 84-15 Caustic filtration. Solution greater than discard level concentration shipped to B774 on pm shift.
3/30/84	114, Line 3	NMSPI 84-16 Pan of fissile material less than 12" edge-to-edge from other fissile material and greater

		than 2" in depth in pan (heaped).
3/31/84	---	Nitrate solution dripped on employee from transfer line Leak due to poor welding job Area and employee contaminated
3/31/84	169, File Cabinet	A filing cabinet contained vials holding Pu of about 20 g. The vials were returned to the glovebox in Room 128.
4/5/84	114, Line 3	NMSPI 84-18. North section of Line 3. Exceeded both total mass limit and individual container mass limit.
4/6/84	114, Line 3	NMSPI 84-19 Line 3 Container on hotplate spaced 7" from FulFlo filter cartridge. Limit requires minimum 12" edge-to-edge spacing.
6/6/84	148, Line 20	NMSPI 84-31. Line 20, Section 884, Button Breakout. 2 1/2" diameter solid sample rack found inside criticality drain.
7/7/84	149, Line 42	Valve failure on tank 470 caused a four foot area to be contaminated.
7/13/84	114, Line 6	Criticality drain overflowed when automatic shutdown valve failed
7/22/84	146A, B	A 30-gallon bag, used to hold decontamination supplies, had no slits cut in it to prevent accumulation of solution.
7/25/84	149, Line 24	Operating personnel were asked to bag wet incinerator ash. The container used to hold the ash exceeded the 4-liter limit.
8/6/84	---	Two 30 gallon bags were underneath fissile solution lines but did not contain slits to prevent accumulation of solution.
8/7/84	146, MT-1	A plastic bag of approximately 14-liters volume was taped to a process line to hold surgeon's gloves No slit was in the bag to prevent build up of liquid
8/27/84	Residue Process	Furnace fire caused by replacing initiators before furnace had sufficiently cooled, starting a fire
9/17/84	164, Box 83	233 g fissile material accumulated in Box 83 exceeding the 200 g limit.
10/4/84	Tunnel	NO_x vapors were detected in 771/776 tunnel. Malfunction in the exhaust damper system was apparently at fault.

10/12/84	149, Line 42	Anion Exchange. Two used FulFlo filter elements on a drying rack were spaced less than 12" from a FulFlo cannister used for floor pickup solutions.
10/14/84	R&D Crusher	A plastic bag was used to hold wet contaminated Kim-wipes. The bag did not contain slits and could have filled to 16 liters violating the 4-liter limit.
11/7/84	Leach Part Cab	The mass limit was exceeded for a storage shelf. 3 parts were on shelf and only 2 are allowed.
12/14/84	164, Box 83	213 g Pu was in Box 83 exceeding the 200 g limit.
1/8/85	149	Three filters were removed from line at one time violating the proper procedure of removing only one filter at a time.
3/26/85	181	A contaminated bag port caused a SAAM alarm to sound. An operator was contaminated - she had not gone through the pre-glove check.
3/28/85	247	A tank containing nitric acid overflowed. The operator left the room without turning off the transfer valve. Automatic shutoff valve failed also
6/13/85	---	A criticality drain overflowed when a valve was accidently left open.
6/27/85	---	A solution was to be transferred from a pencil tank to a Raschig-ring filled tank. The wrong tank was drained causing a violation of the accepted limit of 150 g/liter Pu.
7/1/85	114	A FulFlo filter was spaced only 6" from a filter cannister which was in use. This violated the spacing requirements
7/11/85	149	Package of impure PuO_2 weighed 3861 g while limit is 2500 g.
7/19/85	Utilities	Water running into exhaust fan caused short circuit. When attempt was made to restart fan, worker received shock and fire started.
7/23/85	181	Contamination released when glove was being removed from box.
8/25/85	247	Tank overflowing onto floor while operator was out of room.
9/19/85	149, Line 20	Floor sweepings in Line 20 were placed in a plastic container and taken to the cold storage area near Line

		27. The container containing plutonium and plutonium compounds pressurized and subsequently released radioactive material to room.
9/19/85	149	Glovebox floor sweepings containing moisture were added to sweepings of calcium metal. The exothermic reaction caused a pressure build-up which caused the can seal to break releasing radiological contamination.
11/1/85	---	Liquid was transferred from a safe pencil tank to an unsafe annular tank.
12/3/85	---	Employee mixed bleach, water, and a cleaning agent together causing a gas that made the employee feel sick.
12/3/85	164	Glovebox was undergoing cleanup and exploded when acetone ignited from an operating hot plate. Technician injured by window glass.
12/9/85	East Annex	Two drums exceeded maximum amount of fissile material of 500 g per drum.
12/15/85	---	High urine sample. Sensitive report.
1/14/86	149	Five containers containing fissile material were place into glovebox violating limit of four containers.
1/24/86	149	Combustible material of over 1000 g was placed in a glovebox violating the limit.
2/15/86	---	Contaminated employee. Sensitive report.
2/18/86	149	Two containers combined exceeded limit of 2500 g Pu.
2/20/86	114, Line 11	A vacuum trap would not drain. In an attempt to fix the problem, an operator felt drops of liquid falling on his head. He was found contaminated and taken to medical. It was determined that a weld in the neck flange had failed, allowing steam and condensate to leak out. A further inspection found four vacuum traps with faulty welds.
2/27/86	249	Due to a lack of argon to a welding torch, it sparked and fly ash began to smolder on a filter.
3/17/86	114, Line 3	NMSPI 86-7 Operators introduced two cans of material into Line 3, failing to observe mixed feed left in a batch can on the batching table. The combined weight was 5429 g which is over the limit of 5000 g for the area.

4/24/86	114, Lines 13/14	Two chemical operators were found to be highly contaminated after working a drybox. 11 gloves were found contaminated, but no holes in any gloves were found The procedure for self-monitoring after working in gloveboxes was apparently not followed, which caused spreading of contamination.
4/28/86	114	Two carpenters were assigned to remove a handle on a shield for decontamination. They left for lunch before removing the handle and upon returning found the handle already removed.
5/3/86	114, Line 7	NMSPI 86-11. Two containers were spaced less than 12" apart and 2047 g Pu were present in an area where only 2500 g are allowed.
5/6/86	249	Negative on the incinerator plenum airlock was non-existent during undressing of person in supplied air suit causing person to become contaminated. This happened because both equalizer valves were closed at the same time.
5/16/86	114, Lines 6/7	Two chemical operators found themselves contaminated after using new gloves. Upon inspection it was found that almost 70% of the new gloves had cracks and minute tears in them Upon changing the gloves, contamination was released into the room.
5/23/86	180D, Line 21C	NMSPI 86-12. Sludge material in a pan was dry, but not placed in an 8801 can before being introduced into the operating line
6/21/86	148, Line 19	NMSPI 86-14. Two buttons were produced, weighing 2109 and 2111 g, respectively, in violation of the 2100 g limit.
6/27/86	Residue Process	An operator was injured by a pressurized incinerator feed drum when it was opened. The drum lid hold-down mechanism was not resting atop the drum lid When the drum ring was removed, pressure form inside the drum pried the unbolted drum ring off, raising the lid. The operator's hand and hip were struck by the drum ring when the pressure was released from the drum
7/11/86	114	Four used filter cartridges and one used filter found in line thus exceeding nuclear materials safety limit of four
8/11/86	249	Plutonium material was heaped in a 2" pan in line batching section. During routine maintenance of feed auger material was spilled on floor, causing an excess build-up of material on the floor During

		clean up a 2" pan was heaped causing violation.
9/2/86	149, Line 23	Too many containers containing fissile material were found in Line 23 Batching area.
9/25/86	Grinnel Fire Alarms	Criticality alarm panel was without emergency power when electricians stripped out abandoned wiring.
10/12/86	114B, Line 17	NMSPI 86-22. At shift change, personnel noticed the free-metal canister in the line contained 628 g of free-metal which is over the limit of 500 g.
10/27/86	114, Line 5	NMSPI 86-24. An empty poly plastic bag-out bag (18 x 24") was found open hanging underneath a fissile solution transfer line. No criticality drain slits were cut in the bag.
10 27/86	114, Line 15	NMSPI 86-23. A dirty FulFlo filter cartridge was removed from the FulFlo filter in Line 15 The cartridge was then placed on the flange of 516A digestor, causing a violation of the spacing limit between containers containing fissile material.
10/27/86	Door 1	Locking mechanism on secured door failed.
11/6/86	–	Maintenance operations were in process of removing items from a glovebox system, as workers were removing a piece, plutonium contamination was released to the area.
11/6/86	163, Box 115	Inadequate job review and lack of communication, inadequate site preparation, and misapplication of procedures resulted in release of plutonium oxide to room atmosphere from glovebox. Five employees required body counts
12/10/86	148, Lines 19, 20	Smoke build-up, containing high levels of airborne contamination, from the plasma arc cutting system remained in supplied air house for short time after cutting had ceased. Three employees became contaminated while removing a breathing air garment.
1/28/87	114, Line 7	Smoke and fire inside glovebox apparently started by a hot plate that was left on and turned upside down near some combustibles
2/5/87	147, Can Counter	NMSPI 87-3 NDA operator wrote 159 g instead of 259 g when transferring the gram value to package When package was placed in 55-gallon drum, drum contained 1030 g which is over limit of 1000 g.
3/1/87	114, Line 11, 15	A glove on Line 11 and a glove on line 15 failed, causing contamination of 3 personnel, equipment and

		the tracking of floor area. Entire operation was shutdown until decontamination was complete. None of the operators received body burdens.
3/2/87	149, Line 24	Operator noticed material sparking and glowing in a can of fines transferred to B771 from B707 Reaction took place in a glovebox. Fines were not burned twice as procedure calls for.
4/10/87	Tanks 362, 363	NMSPI 87-8. Drain valve on Tank 362 locked in open position during approved transfer of solution from tank 363 to B774. Approximately 40 liters of unsampled solution from tank 362 were transferred with solution from tank 363.
4/13/87	114, Line 5	NMSPI 87-9. Midnight shift chemical operator changed FulFlo filter in Line 5 and placed used filter on drying stand, approximately 6" from another filter Limits specify that filters must be spaced 12" or more from each other.
4/14/87	146A, Line MT-5	A cake pan (9 1/2 x 6 x 2", 1.6 liter volume) was used for blending enriched uranium oxide batches to obtain a consistent mixture. The cake pan violated the volume limit of 1 liter.
4/23/87	114	NMSPI 87-13. Stainless steel pump transfer container of approximate dimensions 18 x 18 x 24" was found with no lid. Container was placed under a fissile solution transfer line violating the four liter volume rule.
5/8/87	Outside	A light driver was transporting HF cylinders from B130 to B771 HF storage area. As truck was turning corner and moving over rough road, one strap loosened allowing cylinders to roll toward back of truck. Forklift operator stopped cylinders from rolling off. One operator received slivers in arm.
5/19/87	149, Line 37	Two employees entered supplied air and removed a blank on incinerator. Air mover was taken out of service to supply negative pressure. Negative pressure was being lost so air mover were turned back on to minimized contamination release.
7/1/87	Nitric Acid Dumpster	Operator noticed a leaking hose on portable dumpster which supplies nitric acid to chemical makeup area. Approximately 35 gallons of nitric acid leaked from hose to soil. Acid was neutralized with potassium hydroxide flakes and sodium bicarbonate.
7/23/87	Maintenance Dock	Heavy driver was transporting a 10 cu yd capacity compactor box with the compactor trash truck. He lifted the box up to see pedestrians and nicked

		slightly sagging telecommunication wires.
7/29/87	146B	NMSPI 87-18. Cover of sump pump pit enclosure was left open during the replacement of the sump pump The pit has unsafe dimensions and there are fissile solutions in pipes located near the pit.
8/13/87	149, Line 29	NMSPI 87-20. Two 4-liter containers of laboratory waste were placed in the ion exchange area, approximately 8" from the tertiary column. This violated the established nuclear safety limit allowing a single 1-liter container and 12" spacing.
8/19/87	114, Line 3	An operator moved a dirty FulFlo filter to the north end of Line 3 to be bagged out. Dirty FulFlo filters are not allowed in the north batching area of Line 3 violating a nuclear materials safety limit.
8/25/87	249	A sheet metal worker was grinding a weld on the penthouse inside FU-1 filter plenum when his ladder slipped. The workman released the grinder to catch his balance and it struck his left wrist. Five sutures were required to close the wound.
8/31/87	114B, Line 17	A mix of water and hydrofluoric acid was introduced into hydrofluorinator resulting in moist plutonium tetrafluoride. The reaction between this moist material and calcium metal pellets produced sufficient heat to ignite and cause open hearth reduction.
9/4/87	183	When opening the secondary containment on a shipment of metallographic samples, the operators realized the third inner bag was not sealed. 1400 sq ft. of room was contaminated. Operators were contaminated on their hands and arms.
9/10/87	108A	Wiring on a hot plate in use in a glovebox began to burn. A tygon hose lying on the floor next to the hot plate had a hole melted in it and water leaked onto the glovebox floor.
9/28/87	Comcor A	Asbestos contaminated dust, which had collected on top of ceiling tiles became airborne when the ceiling tiles were removed and contaminated two individuals
10/13/87	149, Line 30	NMSPI 87-26 Night shift found two containers containing buttons sitting next to each other in a 10 x 72" O-ring bag. This was in violation of the 12" spacing requirement for Line 30
11/4/87	149, Line 42	NMSPI 87-28 Resin was cleaned from the glovebox floor, placed in Kraft tube, eluted, removed from Line 42, and placed in drum Results

		from drum counter showed 823 g Pu, exceeding the allowed limit of 500 g.
11/16/87	114	NMSPI 87-29 55-gallon drum was taken to drum counter and found to contain 608 g of Pu which exceeded the allowed Pu limit of 500 g.
1/12/88	149, Line 38	Operating personnel were conducting routine monthly glove changes. Operator was unable to maintain seal between the glove and glovebox and a small amount of incinerator ash was released into room contaminating operator, radiation monitor, and area.
1/13/88	114, Line 16	During re-assembly of calciner after inventory teardown, personnel discovered a contaminated glovebox glove. Contamination was released while maintenance personnel were making a glove change to replace the contaminated glove.

Appendix 2
List of Major Chemicals Used In Building 771
(Primary Reagents in Bold Type)

Process Reagents	
Aluminum Nitrate [13473-90-0]	2730 kg
Anhydrous Hydrogen Fluoride [7664-39-3]	Not Available
Calcium Fluoride[7789-75-5]	Not Available
Calcium Metal [7440-70-2]	Not Available
Dihexyl Diethylcarbonyl Methylene Phosphonate	Not Available
Dodecane [112-40-3]	Not Available
Ferrous Sulfamate	1400 l
Hydrochloric Acid 37% [7647-01-0]	45 kg
Hydrofluoric Acid 47-70% [7664-39-3]	120 kg
Hydrogen Peroxide 35% [7722-84-1]	210 kg
Ion Exchange Resins	
Amberlite XAD4 cation	350 kg
Lewatit MP500	550 kg
Lewatit UMP950	1100 kg
DOWEX 1X4 anion	90 kg
DOWEX MSC-1 cation	570 l
AG1-X2	Not Available
Dow 1-X2	Not Available
Dow 1-X8	Not Available
50W-X12	Not Available
ION-X	Not Available
Nitric acid [7697-37-2]	
0 35N (underground tankage)	1120 l
7N (underground tankage)	800 l
12N (underground tankage)	2300 l
Nitrous oxide	120 kg
Potassium Hydroxide 45% (above ground tankage) [1310-58-3]	21,000 l
Pyrotechnic Initiators	
Magnesium metal powder [7439-95-4]	1 kg
Potassium Iodate [7681-11-0]	1 kg
Sodium Peroxide [1313-60-6]	0 5 kg
Sodium Hydroxide (Building 774) [1310-73-2]	Not Available
Sulfamic Acid [5329-14-6]	10 kg
Sulfuric Acid [7664-93-9]	300 kg
Tributyl Phosphate [102-85-2]	5 kg

Process Feed Materials

Beryllium [7440-41-7]
Crucibles
Gloves and Combustibles
Graphite
HEPA Filters

Production Materials

Americium oxide
Americium nitrate
Ammonium diuranate
Neptunium

78

Plutonium fluoride	
Plutonium hydride [15457-77-9]	
Plutonium metal	
Plutonium oxide	
Plutonium nitrate [14913-29-2]	
Uranium metal [7440-61-1]	
Uranium oxide [1344-57-6]	
Uranyl nitrate [10102-06-4]	
Uranyl sulfate	
Other Facility Operating Materials	
Diesel Fuel Oil #2 (underground tankage)	21,200 l
Propane (above ground tankage)	7600 l
Paint, Varnish, Adhesive, Epoxy	2600 l
Lead-Tin Solder	14 kg
Led-Plate No. 250	10 kg
Photographic Chemicals	150 l
Refrigerant	30 l
Vacuum Pump Oil	420 l
Floor Dry	510 kg
Lead-loaded Safety Glass	
Lead Oxide in Gloves	
Lead Shielding	
Polycarbonate Windows	
AG-471	40 l
Alcohol	50 l
Acetylene	1140 cu ft
Ammonium Hydroxide [1336-21-6]	36 kg
Ammonium Sulfate [7783-20-2]	12 kg
Ascorbic Acid [50-81-7]	1900 l
Cadmium [7440-43-9]	10 l
Calcium Nitrate [10124-37-5]	150 kg
Caustic Potash	210 l
Citric Acid, Monohydrate [77-92-9]	1900 l
CO61 Media	1900 l
Fluorspar	90 kg
Hydroxylamine Hydrochloride [5470-11-1]	16 kg
Magnesium Oxide (fire suppression sand) [1309-48-4]	525 kg
Nitrated Resin	210 l
Oxalic Acid [144-62-7]	50 kg
Phosphoric Acid [7664-38-2]	10 l
Potassium Fluoride [7789-23-3]	65 kg
Reillex HPQ	330 kg
Silver Nitrate [7761-88-8]	90 kg
Silver Oxide [20667012-3]	100 g
Silver Sulfate	120 g
Sodium Acetate [127-09-3]	5 5 kg
Sodium Bicarbonate	10 kg
Sodium Carbonate [497-19-8]	55 kg
Sodium Chromate [13517-17-4]	35 kg
Sodium Hydroxide [1310-73-2]	5 kg
Sodium Hypochlorite	6 l
Sodium Nitride [12136-83-3]	45 kg